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A Synopsis of Stereocaulon *with notes on some exotic species* (1)

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During the past year, in connection with his studies of Costa Rican lichens, the writer has found need for a working key to this genus and has constructed one which has proved useful in naming a large number of exotic specimens in the Farlow Herbarium. It ls presented in the hope that it may prove useful to other lichenologists.

The species recognized as valid are those so recognized in Zahlbruckner's *Catalogus lichenum universalis* except in cases where notes on the types by the late Lincoln Ware Riddle seemed to indicate otherwise. During the academic year 1912-13, Dr. Riddle spent much time in various European herbaria, studying types and collecting materials toward a monograph of *Stereocaulon*. These fragmentary notes deal mostly with tropical species, as the boreal species had already been treated in his previous paper (2). A year of illness followed by heavy teaching schedules and the detrmination of large series of specimens in connection with his contributions to floras of the West Indies, caused him to lay aside his notes which are now in the Farlow Herbarium along with his herbarium. These fragmentary notes haves been freely used by the writer in preparing the key and the more extensive ones have been arranged for publication in the present paper. Mention should also be made of the excellent paper by A. H. Magnusson (3) which has proved helpful in dealing with the boreal species of Europe.

(1) Contributions from the Cryptogamic Laboratories of Harvard University nº 103.

(2) Riddle, L. W., The North American Species of Stereocaulon. *Bot. Gaz.* 50: 285-304. 9 *f.* 1910.

(3) Magnusson, A. H., Studies on boreal Stereocaula. *Goteborgs K. Vetensk. och Vitterh. Samh. Handl.* IV. 30: 7: 1-89. 1926.

The writer has tentatively recognized many species, rather than to risk confusing the synonymy by reducing them to varieties before studying an abundance of material.

KEY TO STEREOCAULON

Primary thallus persistent, never chalky, boreal **PROSTEREOCAULON**

Podetia not ending in soredia

Spores 20-28 × 2.5-3, average 23 × 2.6 μ with pointed ends : squamules granular, rarely coralline *S. condensatum*

Spores 23-34 × 3.5 μ ; squamules granular, verruciform *S. denudatulum*

Spores 34-48 × 3 μ ; squamules subturgid, verruciform, conglomerate *S. condensatum* var. *acaulon*

Podetia ending in soredia

Cephalodia with *Stigonema,* KOH- ; spores 16-29 × 3.5-5 μ, average 21.4 × 3.9 μ with blunt ends *S. pileatum*

(For varieties and nomenclature see p. 000.)

Cephalodia with *Nostoc,* KOH + ; apothecia unknown

Soralia white ; on earth ; Sweden *S. farinaceum*

Soralia brownish gray or roseous, on stone ; Siberia *S. leprocephalum*

Primary thallus persistent or evanescent; squamules granular or chalky; apothecia and cephalodia absent **CHONDROCAULON**

Podetia subsimple, 2-6 mm. white or aeruginous ; granules 0.1 mm. diam. ; boreal *S. nanum*

Podetia more or less branched, darkening below, squamules ashy white ; subtropical alpine

Podetia tawny brown, dendroid branched ; perhaps pale sea green when freshly collected ; Himalayas (9-10,000 ft.), Malay Peninsula (3300 ft.) *S. arbuscula*

Podetia lighter, shrubby branched, 6-14 mm. ; Peru

Granules fine *S. albicans*

Granules coarser *S. gracilescens*

Podetia lighter, caespitose, subsimple to fastigiately branched, with scattered verruciform-conglomerate squamules, white, less chalky, more turgid, ½ mm. diam. ; Peru *S. congestum*

Primary thallus evanescent
Cephalodia sessile to subemersed, either aeruginous or dark gray or brown
Tips of podetia flattened and squamiform **STEREOCLADIUM**
Squamules absent
Not sorediate ; Alaska, Siberia *S. Wrightii*
Sorediate ; Europe
Podetia compressed, 0.2-1 cm. *S. tyroliense*
Podetia terete, 3-5 cm. *S. spathuliferum*
Squamules present, areolate diffract, ashy, glaucous center and whitened edges, similar to those of *S. denudatum ;* tips of podetium more highly foliolate; Japan *S. foliiforme*
Tips of podetia not flattened
Squamules palmate digitate
Cephalodia gray to black, mostly subglobular with *Stigonema,* podetia glabrous to moderately tomentose,
KOH + *S. paschale*
With large spherical soralia f. *sorediatum*
Without soralia
Podetia reduced, subcrustose ; apothecia large
f. *subcrustosum*
Podetia well developed
Podetia 4-8 cm., apothecia 1.5-3 mm., terminal
var. *grande*
Podetia shorter
Podetia decumbent (see also var. *conglomeratum*)
Squamules in tufts var. *evolutoides*
Squamules scattered, densely branched
var. *serpens*
Podetia erect
Podetia more or less solitary ; 1-1.5 mm. thick, little branched f. *taeniarum*

Podetia crowded, branched

Upper branches very crowded

f. *thyrsoideum*

Upper branches less crowded

f. *vulgare*

Cephalodia unknown ; squamules difform verruculose ; podetia 4 cm. tall ; spores 16-23 × 2.5-3 μ

S. subintricans

Cephalodia eruginous, minute and subemersed, with *Nostoc ;* podetia densely to moderately tomentose (for varieties see p. XXX) *S. tomentosum*

Squamules dominantly coralline

Squamules coralline to fibrillose, slender and more or less branched

Podetia subsolitary, glabrous, apothecia mostly terminal, large ; temperate *S. coralloides*

Hymenium 55-65 μ ; apothecia 2-5 mm. diameter, podetia 5-8 cm. var. *intermedium*

Hymenium 50 μ ; apothecia 1-2 mm. podetia 2-4 cm.

Main axis distinct, medulla KOH + ; apothecia convex var. *typicum*

Main axis indistinct ; medulla KOH — ; apothecia plane var. *subcoralloides*

Podetia subsolitary, branched above, densely tomentose ; apothecia mostly lateral, small and numerous ; tropical

Podetia up to 10 cm. thick, very much branched, squamules sparse ; apothecia small and very numerous ; on mosses *S. myriocarpum*

Podetia 3-4 cm. sparingly branched, sometimes simple above and caespitose as in *S. denudatum;* squamules crowded ; apothecia numerous, larger

S. Orizabae

Podetia subsolitary, simple or slightly branched, attenuate above, glabrous ; apothecia small, lateral, squamules becoming foliaceous below, pedicellate umbillicate above ; Jamaica *S. cornutum*

Squamules partly coralline, fibrillose, passing into verruciform states above

Apothecia terminal ; Japan

Cephalodia ashy, with *Stigonema* — *S. verruculigerum*

Cephalodia olive black, with *Gloeocapsa* — *S. japonicum* (cf. *S. uvuliferum*)

Squamules subcoralline, short and turgid ; podetia caespitose ; temperate

Spores 16-20 × 5-6 μ ; not firmly attached to the substrate — *S. evolutum*

Spores 20-40 × 2.5-5 μ ; firmly attached to the substrate, alpine

Apothecia quite common, 1.5-3 cm.

Squamules sorediate farinose, apothecia convex

Podetia 2-3 (-7) cm. densely branched ; soredia 50-100 μ; N. Europe — *S. fastigiatum* var. *dissolutum*

Podetia shorter 1-1.5 (-3) cm.

Podetia simple or nearly so, spores 21-29 × 4-5 μ ; soredia 4-41 μ ; Central Europe — *S. saxonicum*

Podetia sparingly branched ; spores 20-25 × 2-3 μ ; (perhaps immature) ; soredia 30-50 μ ; N. Europe — *S. capitellatum*

Podetia densely branched ; spores 24-42 × 2.5-3 μ ; New England — *S. nanodes*

Squamules not sorediate, farinose, apothecia plane — *S. fastigiatum*

Cephalodia with *Nostoc* — var. *typicum*

Cephalodia with *Stigonema*

Fertile podetia elongate and irregular, apothecia 5 mm. or more in diam. ; cephalodia abundant — f. *irregulare*

Lower part of podetia unbranched, naked ; squamules above, compressed, main axis with roseous tomentosum and granular squamules
f. *finmarkicum* (1)

Podetia in dense mats, squamules granular sorediate ; apothecia rare, confluent f. *congestum*

Cephalodia unknown, podetia intricate, compressed

Podetia thick, often dilated ; phyllocladia more or less squamiform f. *confluens*

Podetia decumbent ; squamules granular, crowded
f. *depressum* (2)

Apothecia rare, small, convex

Squamules grayish, crowded toward the apices, granular
S. spissum

Squamules whitish, covering podetia, incised squamiform
S. saxatile

Spores 6- locular 45 × 3.5 μ; apothecia lecanorine 0.4-0.8 mm.; cephalodia not seen ; podetia 6-8 cm. subsimple below. sparingly branched above ; Mauritius
S. scutelligerum
S. salazinum Auct.

Squamules dominantly turgid verruciform

Podetia tomentose *S. alpinum* group

Tomentum very densely spongiose, extending over the squamules, branches few, short and subsquarrose ; cephalodia fuscescent, smooth, rounded, erumpent

2-3.5 cm. tall ; N. Europe *S. incrustatum*

1-2 cm. tall ; Italy *S. abduanum*

Tomentum not extending over squamules ; branches compact ; cephalodia eruginous, minute, subemersed, with *Nostoc*

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(1) Magnusson places *S. spathuliferum* (see Stereocladium) here as form. Perhaps *S. tomentosum* f. *flabelliforme* should be considered here.

(2) When soralia are spherical, called f. *globuliferum*.

Squamules cylindric to papilliform, dense below, scattered above ; apothecia convex 0.7-1.5 mm.
S. glareosum

Squamules granular

Squamules dispersed, leaving bare spots on the podetia ; apothecia plane, 1-2 (-3) mm. diam.
S. rivulorum

Squamules united into flattened, lobate clusters, scanty below, crowded above ; apothecia more or less convex or irregularly swollen, 1-1.5 mm.
S. alpinum

Squamules crowded above, glabrous and decorticate below ; sterile ; Victoria *S. humile*

Podetia subglabrous ; cephalodia with *Stigonema ;* apothecia lateral ; otherwise as in the *S. alpinum* group ; tropical *S. myriocarpoides*

Podetia glabrous

Squamules granular ; podetia densely branched above

Squamules sorediate (see also alpine sp. *S. saxonicum, S. nanodes, S. capitellatum*) ;

France *S. Delisci*

Kerguelen Land *S. cymosum*

Squamules not sorediate

Decorticate, KOH + ; cephalodia ashy to brownish verrucose ; sterile ; antarctic

Podetia 10-17 mm. KOH — within, Ile Brabant
S. antarcticum

Podetia 15-30 mm. KOH + within, Cape Horn
S. glabrum

Nude, KOH —, cephalodia not seen ; apothecia abundant

Spores 16-23 × 2.5-3 μ Finland
S. subintricans

Spores 28-33 × 2-3 μ Japan *S. gracillimum*

Squamules flattened granulate and closely appressed ; podetia sparingly branched and attenuate : apothecia rare
S. sphaerophoroides

Podetia flexuous up to 7.5 cm. var. *elatum*
Podetia straight, 2.5-4 cm. var. *pumilum*

Squamules dominantly umbilicate, some verruciform, center glauco-testaceous, margin ashy

Squamules umbilicate, discrete ; plant cinereous
Not sorediate *S. denudatum*
Not forming broad pulvinate tufts var. *commune*
Podetia 2.5 cm. high, branched above, tips capitate f. *bracteata*
Podetia thick, subangulate f. *validum*
Podetia slender, more branched ; squamules subrotund, subpedicellate f. *tenue*
Podetia simple below, digitate branched above ; squamules partly rotund, partly umbilicate f. *digitatum*

Forming broad pulvinate tufts var. *umbonatum*
Podetia branching below, forming pulvinate tufts ; squamules crowded f. *pulvinatum*
Podetia little branched, caespitose, squamules subsolitary f. *arenarium*
Podetia densely branched above ; squamules crowded, confluent at their tips, forming a false crust f. *saxicolum*
Podetia densely dichotomously branched throughout ; squamules very small, dense above, absent below

Sorediate var. *caespitosulum*
Podetia branched, squamules flattened, white, often sorediose ; cephalodia large, conspicuous var. *depressum*
Podetia little branched, capitate sorediate f. *capitatum*

Squamules partly umbilicate, partly verruciform, densely crowded and congested

Podetia branched ;
Italy — var. *vesuvianum*
Costa Rica — *S. obesum*
Colombia — *S. verruciferum*
Ecuador — *S. violascens*
Java — *S. graminosum*
Podetia simple ; Mauritius — var. *vulcani*
Podetia fuscescent ; West Africa — *S. obscurum*
Squamules granulate above, squamiform, plane ; below not well developed ; axis KOH + ; Japan — *S. nabewaziense*
Squamules pedicellate and umbilicate becoming subfoliaceous below ; podetia simple and strongly attenuate ;
Jamaica — *S. cornutum*
Squamules minute, not foliose ; apothecia marginate ;
Peru — *S. pityrizans*
Squamules umbilicate, the upper foliaceous ; podetia reduced, not attenuate (see also var. *kilimandscharoense* from Africa) — *S. confluens*
Brown with a bushy habit — var. *fuscescens*

Cephalodia globular, scrobiculate, more or less concolorous with the podetia
Young apothecia open from the first ; spores under 60 μ — *S. ramulosum* group
True cephalodia absent, with black, *Stigonema*-like growth scattered along podetia ; squamules more branched than in *S. ramulosum,* tending to be compressed below ; apothecia lateral and pedicellate ; Antilles — *S. virgatum*
Whole plant KOH yellow — f. *Achariana*
Axis KOH yellow, then red, yellow without — f. *primaria*
Axis KOH yellow, then tawny, KOH-without, squamules somewhat flattened — f. *applanata*
Cephalodia scrobiculate foveolate ; podetia 10-12.5 cm. ; sparsely branched, rugulose corticate, papillate, not squamulose ; Hawaiian Islands — *S. pilophoroides*

Cephalodia with *Chroococcus* (see also *S. coralligerum*)
Podetia up to 12 cm. rugose corticate ; becoming decorticate ;
Jamaica *S. ramulosum*
Apothecia large, squamules reduced to papillae above ; New Zealand *S. macrocarpum*
Apothecia terminal ; pseudolecanorine ;
Colombia *S. lecanoreum*
Campbell Island *S. argodes*
Podetia slender
1-3 cm. tall, sparingly branched, few squamules ;
Brazil, Jamaica *S. microcarpum*
Hawaiian Islands *S. rocelloides*
5 cm. tall, resembling small *S. macrocarpum ;*
Australasia *S. ramulosum* v. *microcarpoides*
Podetia reddish, plants small, Hawaiian Islands *S. rubiginosum*
Squamules folio-compressed ; New Zealand *S. ramulosum* var. *compressum*
Podetia and squamules tomentose ; Campbell Island *S. submollescens*
Sorediate capitate ;
Mexico *S. ramulosum* var. *farinosum*
Africa *S. Meyeri* and var. *Bornmuelleri*
Podetia subsimple and attenuate ; apices free from squamules and farinose ; Kilimandjaro, Africa *S. ramulosum* v. *acuminatum*

Cephalodia with *Scytonema ;* tropical *S. mixtum*
Apothecia large ; Ile Bourbon *S. salazinum*
Podetia slender ; Brazil *S. mixtum* var. *tenellum*
Podetia destitute of squamules, corticate above, cephalodia small *S. mixtum* var. *denudatum*
Podetia sorediate capitate; Mexico *S. mixtum* var. *sorediatum*
Cephalodia with *Stigonema* *S. proximum*
Apothecia large ;
Tasmania and Chile v. *macrocarpoides*
Queensland v. *nudatum*

Podetia slender ; Colombia v. *gracilius*
Podetia colored ; Brazil v. *ferruginascens*
Sorediate above v. *sorediatum*
Compressed ; Colombia v. *compressum*
Podetia and squamules tomentose
Podetia 6-10 cm. densely covered with long, coralline squamules ; Peru *S. exalbidum*
Podetia 4-6 cm. sparsely covered with long coralline squamules ; Campbell Island *S. submollescens*
Cephalodia stipitate clavate, cerebriform, spores 6-locular, 35 × 5 μ ; New Zealand *S. Colensoi*
Young apothecia developing in pyriform tubercles ; spores over 75 μ long
Podetia simple or branching only at the tips ; India, Nepal, Yunnan
Podetia slender 0.5-0.8 mm. diam., decorticate; squamules under 2 mm. long, rigid ; apothecia 1-1.8 mm. *S. piluliferum*
Podetia stouter, 1.5-2 mm. ; rugose to foveolate corticate ; squamules 2-3 mm., minutely foveolate, stiff ; apothecia 2.5-5 mm. diam. *S. macrocephalum*
Podetia 2.5-4 cm., squamules terete, obtuse, simple, less dense and less secund than above v. *strictum*
Podetia 4-7 cm. squamules less well developed ; cephalodia with *Glococapsa* v. *yunnanense*
Podetia simple below, with a few short, spreading branches, 2.5-4.5 cm. tall, 1 mm. in dam. decorticate and arachnoid or partially rugose corticate, without squamules on one side ; squamules coralline, smooth, up to 1 mm. long ; apothecia 1.5-2 mm. diam. ; Yunnan, China *S. sinense*
Podetia simple in lower half, branching above into several subequal spreading branches ; decorticate
Podetia 3-4 cm. ; apothecia terminal ; Mexico *S. claviceps*
Podetia densely tomentose, 5-6 cm., apothecia terminal ; without squamules on one side ; Java

Cephalodia with *Scytonema* — *S. nesaeum* and varieties

Cephalodia with *Stigonema* — *S. Massartianum*

Podetia more or less tomentose, over 5 cm. ; apothecia lateral ; squamules more evenly distributed — *S. strictum* (*S. peladense*)

Podetia with long ascending branches below and short spreading branchlets above; rimose corticate; squamules capitate sorediate ; Japan — *S. sorediiferum*

Podetia similar to *S. sorediiferum* but more branched ; lower squamules 8 mm. long, repeatedly branched ; podetia 3-6 cm. tall, 1-1.5 mm. diam. ; Mexico — *S. vimineum*

Podetial branching unknown, corticate or areolate corticate ; squamules 1-5 mm. long, not sorediate ; Mexico — *S. pachycephalum*

Cephalodia botryose, concolorous, glaucescent, Eastern Asia — *S. botryophorum* group

True squamules absent, replaced by powdery white granules or soredia ; podetia 0.8-2 cm. branched ; cephalodia stalked, minute, cinereous ; New Zealand (see also *S. leptaleum, S. corticatulum*)

Squamules terete, simple or verruciform ; Japan

Podetia 4-9 mm. simple ; spores 30-55 × 4.5-5.5 μ — *S. octomerellum*

Podetia 1.7-2.3 cm. ; spores 2-4-8-locular, 33-40 × 6-7 μ ; cephalodia with *Nostoc,* cinereous to nigrescent — *S. curtatum* (*S. octomerum*)

Podetia 2-3 cm. ; spores 4-locular, 22-36 × 3.5 μ ; cephalodia with *Gloeocapsa,* cinereous to olivaceous — *S. uvuliferum*

Squamules coralline below, verruciform above ; podetia 1.2-1.5 cm., subtomentose ; spores 30-32 × 4 μ — *S. japonicum*

Squamules coralline

Podetia 2-4 cm. ; squamules 2 mm. with whitened tips ; spores 12-locular, 75 × 5 μ ; cephalodia with *Stigonema,* darkening ; India — *S. botryophorum*

Podetia 4-8 cm. ; squamules 1-3 mm. ; spores 4-8-locular, 38-48 × 4-5 μ ; cephalodia with *Gloeocapsa,* cinereous ; Japan *S. exutum* (*S. subramulosum*)

Squamules terete

Squamules compressed ; cephalodia lighter f. *complanatum*

Podetia up to 4 mm., prostrate sparingly dichotomously branched ; squamules terete up to 8 mm. long, branched ; spores 4-locular, 24-27 × 3-4 μ ; cephalodia reddish ashy with *Stigonema ;* Japan *S. prostratum*

Squamules coralline to subfoliose, subdichotomous, rugose, pale beneath, 1-3 mm. ; podetia 2-4 cm. ; spores 14-16-locular, 100 × 5 μ ; cephalodia with *Chroococcus* dark tawny ; Himalayas *S. foliosum*

Cephalodia globular and more or less stalked, or unknown ; apothecia lecanorine or pseudolecanorine (parathecium highly developed)

Apothecia truly lecanorine ; cephalodia unknown

Podetia short, 4-9 mm. × 0.25-0.5 mm. ; corticate above, decorticate blackening below ; hypothecium colorless ; spores 4-locular, 13-15 × 4 μ ; Antarctic *S. pygmaeum*

Podetia long, 6-8 cm. × 1-1.50 mm., wholly decorticate, attenuate above ; hypothecium fuscous, spores 6-locular, 45 × 4.5 μ ; Mauritius

Podetia arachnoid ; (including *S. vulcani* Auct. and *S. salazinum* Auct.) *S. scutelligerum*

Podetia almost denuded, surface smooth, polished *S. Richardianum*

Apothecia pseudolecanorine

Cephalodia abundant; podetia branching near the base; squamules few, confined to base of podetium, coralline ; spores 6-locular

Cephalodia large, ashy, cerebriform, stalked, with *Stigonema ;* podetia caespitose, stout, glabrous, rugose-corticate ; squamules subsimple; spores 35 × 5 μ; apothecia lateral; New Zealand *S. Colensoi*

Cephalodia scrobiculate 3 mm. spherical ; podetia subsolitary, 6-8 cm. × 2 cm. ; decorticate glabrous below, rugose or unevenly verrucose corticate above ; squamules stout, branched ; apothecia 4 mm., terminal ; spores 32-42 × 6 μ ; Campbell Island *S. argodes*

Cephalodia unknown or rare ; hypothecium dark brown ; America

Podetia caespitose, 2-4 cm. × 1.5-2 mm., subtomentose ; squamules abundant, umbilicate ; apothecia lateral, 1-1.5 mm. ; spores 2-4-locular, 24-26 × 3-3.5 μ ; Peru *S. pityrizans*

Podetia solitary, 4-7 cm. × 1.5-2 mm., tomentose ; squamules few, coralline, terete ; apothecia terminal, 1.2-2 mm. ; spores 8-locular 50-55 × 4-4.5 (72-80 × 5 fide Nyl.) ; cephalodia rare, like *S. ramulosum* containing *Chroococcus* ; Colombia *S. lecanoreum*

Stereocaulon abduanum Anzi, Comment. Soc. Crittogam. Ital. **2** : 3. 1864.

S. incrustans Anzi, Lich. Lang. Exs. 14. (not Floerke).

S. tomentosum var. *abduanum* Olivier, Mem. Soc. nation. Sci. Nat. Cherbourg **36** : 162. 1907.

Type : Adda, Italy

Stereocaulon albicans, Th. Fr., De Stereoc. et Piloph. 36. 1857.

S. tenellum Tuck. Bot. Wilkes Voy. 123. 1861.

S. nanum Auct. Amer.

Type from Peru, HAENKE, also GAUDICHAUD at Upsala. The Haenke type is best developed, 14 mm. tall, shrubby branched, chalky white. The Gaudichaud type is only 6 mm. tall and less branched.

Type of *S. tenellum* from Peru, Wilkes Exped. in Tuck. Herb. at Farlow Herb.

var. **gracilescens** (Nyl.) Dodge n. comb.

S. gracilescens Nyl. Ann. Sci. Nat. Bot. IV **11** : 210. 1859.

Type from Carabaya, Peru, WEDDELL, in Mus. Paris is scarcely distinct from *S. albicans* although the granules are somewhat coarser.

Stereocaulon alpinum Laurer apud Funck, Cryptog. Gewächse **33** : 6. 1827.

? *Lecidea artyta* Ach. Lich. Univ. 170. 1810.

Stereocaulon tomentosum var. *alpinum* Th. Fr. De Stereoc. et Pilophor. Comment. 30. 1867.

S. paschale f. *ramuliferum* Nyl. Notiser Sällsk. Fauna Fl. Fenn. Förhandl. **5** : 111. 1882.

S. alpinum var. *botryosum* Schaer. Lich. Helv. Spicil. **6** : 277. 1833 not Laurer apud Fr. 1831 nor Ach, apud. DC et Lam. 1805 according to specimens at Upsala.

Authentic specimens from Salzburg Mts. misit LAURER at Upsala. are typically densely tomentose, squamules either all verruciform or lower incised crenate ; typically somewhat turgid and whiter in most species of *Stereocaulon ;* cephalodia minute, subglobose, aeruginous.

f. **adpressum** Magnusson, Göteborgs K. Vet. o. Vitterh, Samh, Handl. IV. **30** : 7 : 58. 1926.

f. **pulvinarium** Savicz, Notul. Syst. Inst. Crypt. Hort. Petropol. **2** : 169. 1923.

var. **alpestre** (Flotow) Th. Fr. Nov. Act. K. Vetensk. Soc. Upsala III **2** : 358. [54] 1858.

S. tomentosum var. *alpestre* Flotow, Flora Beiblätter **19** : 17. 1836.

? S. tomentosum var. *majus* Schaerer, Lich. Helv. Spicil. **6** : 276. 1833.

S. tomentosum var. *granulosum* Schaerer, Enum. Crit. Lich. Eur. 181. 1850.

S. alpestre Hue, Nouv. Arch. Mus. [Paris] III. **2** : 247. 1890.

As Th. Fries states, this puzzling variety seems to connect *S. tomentosum* and *S. alpinum.*

f. **stigmateum** Flotow, Flora Beiblätter **19** : 18. 1836.

Type from below Schwarze Koppe, Riesengebirge, Flotow, not seen.

var. **botryosum** (Ach.) Laurer apud Fr., Lich. Eur. Ref. 204. 1831.

S. botryosum Ach. apud DC et Lam., Fl. Franç. ed. 3. **6** : 178. 1805.

Lichen botryosus Lam., Encycl. Meth. Bot. Suppl. **3** : 358. 1813.

Patellaria paschalis var. *nodosa* Wallr., Fl. Crypt. Germ. 3 : 442. 1831.

S. alpinum var. *verrucosum* Th. Fr. Nov. Act. R. Soc. Sci. Upsal. III. 2 : 1 : 357. 1858.

S. tomentosum var. *botryosum* Nyl. Lich. Scand. 64. 1861.

Type from Switzerland in Mus. Fenn. is a very compact variety of *S. alpinum* with congested squamules and subglabrous podetia. MAGNUSSON treats this as a synonym of *S. fastigiatum*. If this is correct, then the latter name should fall into synonymy and the group should bear the name *S. botryosum* Ach. I am leaving this as it is rather than make any new combinations of all of Magnusson's forms and variety under *S. fastigiatum* until I have had an opportunity to study all the types concerned.

Stereocaulon antarcticum Vainio, Résult. Voy. S. Y. Belgica, Bot. 16. *pl.* 2. *f.* 7. 1903.

Type : Détroit de Gerlache, à l'Ile Brabant on a rock in a glacier 64° 21' S. EMILE G. RACOVITZA. RIDDLE suggests that the figure resembles *S. cymosum* Crombie, see p. 116.

Stereocaulon arbuscula Nyl., Syn. Meth. Lich. 253. 1860.

Type from Tonglo, Sikkim, Himalayas, 9,000-10,000 ft. J. D. HOOKER et THOMSON 2160 in Mus. Fenn., cotype in Kew Herb.

Podetia caespitose or solitary, 1-2 cm. tall, 0.5 mm. in diameter at base, very slender, soft, beautifully dendroid branched, the larger branches denuded, decorticate glabrous or faintly arachnoid, the main branches bearing, especially toward the ends, numerous fine coralloid branchlets on which are clustered the minutely granuliform squamules. The whole plant is white (pale virescent ashy teste Hooker) becoming tawny in the herbarium. Apothecia and cephalodia unknown.

Suggestive of *S. albicans* but much more dendroid branched.

RIDDLE mentions specimens from Malay Peninsula, Japan, Queensland and Samoa.

Stereocaulon argodes Nyl. Comptes Rendus Acad. Sci. Paris 83 : 88. 1876.

Type from Expedition à l'Ile Campbell 1874, M. FILHOL. in Mus. Fenn, duplicate in Kew Herb., and in Farlow Herb.

Podetia subsolitary, 6-8 cm. tall, 2 mm. thick in lower part, branching from near the base and with short, spreading branches above, decorticate and glabrous in the lower third or half; with a very rugose or unevenly verrucose cortex above. Squamules very few and confined to the basal portions of the podetia, stout, branched. Cephalodia ochraceous, pedicellate and scrobiculate, globular, reaching 3 mm. in diameter. Apothecia large, reaching 4 mm., wholly terminal, convex, disk nigrobadius, with a more or less distinct ochraceous, pseudothalline margin.

In microscopic section, the hyphae of the medulla come together more compactly to form the outside, but no distinct cortex. Separable from forms of *S. macrocarpum* only by margined apothecia. Riddle was unable to find any algae in the apothecia.

RIDDLE concluded that *Stereocaulon implexum* Th. Fr. De Stereoc. Piloph. Comment. 23. 1857 was probably a synonym of this species. If so, it has priority. The types from the Straits of Magellan, ANDERSSON, also LECHLER 981 in Herb. Upsala, are depauperate specimens including especially the basal portions of podetia similar to those of *S. argodes* Nyl. A specimen from N. Zealand, HOCHSTETTER 1859, labelled by Th. FRIES *S. implexum* is also very close, differing only in having turgid, papilliform squamules on the upper part of the podetia, and in the apothecia not being so obviously marginate, although two young apothecia give indications of it. Or it may be the basal part of *S. macrocarpum*. Probably only the examination of a large series of specimens of these species and comparisons with the types, can decide the synonymy.

Stereocaulon botryophorum Müll. Arg., Flora 74 : 371. 1891.

Type from above Thala in Ganges valley, 12,000-13,000 ft. Tihri-Garwhal, Northwest India, DUTHRIE 4304, (sterile) in Herb. Boissier and cotype in Kew Herb. The following specimens in Kew agree with the type ; Wallanchoon, Sikkim, HOOKER et THOMSON 2179 (sterile) and Kaukola, Sikkim, 12,000 ft. HOOKER et THOMSON 2174 (fertile). The description of apothecia below is based on this specimen.

Podetia 20-40 mm. tall, 2-3.5 mm. in diameter, stout, irregular

and appearing deformed with one or two branches and a few short, spiniform branches, the whole plant very rigid ; wholly decorticate, subglabrous, and more or less denuded ; squamules, in parts where they occur, crowded and rigidly spreading, coralline, branched, irregular, terete, verrucose, with whitened ends, averaging about 2 mm. in length ; apothecia 1-2 mm. in diameter with pale hypothecium and spores 12-locular, 75 × 5 μ, lighty curved but scarcely spiral ; cephalodia in deeply botryose masses, concolorous or partly darkening, the masses reaching 4 mm. in diameter the single division 0.5-0.8 mm. containing *Stigonema.*

The whole plant has a deformed appearance, probably due to its habitat. Distinct from *S. ramulosum* in the type of cephalodia, to be separated from the other species with botryose cephalodia by the fact that here they are not at all cinereous. The type of cephalodia however is not the same as in the other species of this section and the spores are different.

Stereocaulon capitellatum H. Magnusson, Göteborgs K. Vetensk. o. Vitterh. Samh. Handl. IV. **30** : 39. 1926.

Stereocaulon claviceps Th. Fries, De Stereoc. et Piloph. Comment. 21. 1857.

Type from Mts. of Mexico, LIEBMANN in Herb. Upsala.

Podetia solitary, 28-40 mm. tall, about 1 mm. in diameter, simple below with short, spreading branches above, wholly decorticate and glabrous, more or less denuded of squamules. Squamules abundant in lower half of podetia, sparse or subabsent above, the lower exactly as described for. *S. nesaeum* (see p. 130) as are also the upper, which are not at all strigose as in *S. pileliferum*. Cephalodia of the type of *S. ramulosum,* tawny, small; about 1 mm. or less, not strongly scrobiculate. Apothecia all terminal on the branches into which the podetia divide (i. e. no main podetium in upper part), developing in tubercles ; when mature, strongly convex, 1-2 mm. broad. emarginate, fulvous to badius.

Stereocaulon Colensoi Churchill Babington in Hooker f., Fl. New Zealand 2 : 295. pl. 130. 1855.

Type from North Island, New Zealand, COLENSO 2746 in Babington Herb. Cambridge Univ. and cotype at Kew Herb.

Podetia caespitose, stout, glabrous, rugulose corticate, branching from the base. Squamules few and confined to the base, elongated coralline, branched, terete, unequal, obtuse. Cephalodia abundant, large ashy, cerebriform with fine convolutions, stalked, with *Stigonema*. Algae just below hypothecium, spores 6-locular, 35 × 5 μ, ends obtuse.

A second specimen in Kew Herb., from Prov. Canterbury, N. Z. SINCLAIR et HAAST 1860, labeled this is different. Podetia decorticate and more branched, squamules abundant, coralline, more or less elongated but subsimple. Cephalodia smaller and more deeply convolute. Apothecia abundant large, reaching 4 mm.

ZAHLBRUCKNER follows Knight, Trans. Proc. N. Z. Inst. 16 : 400 pl. 39 f. 1. 1884 in placing this in *Pilophoron*.

Stereocaulon condensatum Hoffn., Deutschl. Fl. 130. 1796.

? S. Meissnerianum Floerke, Deutsch. Lich. **4** : 14. 1819 (only cephalodia described).

var. *condyloideum* Nyl., Lich. Scand. 65. 1861.

NYLANDER was reducing Acharius' *S. condyloideum* (Meth. Suppl. 51. 1803.) but in uncertain just what ACHARIUS' type represents. Th. Fr. referred this to *S. paschale* with more or less evanescent squamules, while VAINIO referred it to *S. condensatum*. RIDDLE, after examination of the Acharian type in Mus. Fenn., states « material too poor for certain determination, Vainio probably right. » MAGNUSSON reduces this to a form.

f. **septentrionale** M. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 67. 1926.

f. **crustaceum** (Wallr.) Rabh., Flecht. Europ. **13** : 370. 1858.

Patellaria pileata var. *crustacea* Wallr., Flora Cryptog. Germ. 3 : 441. 1831 *S. condensatum* var. *minor* Egeling, Ber. f. Naturk. Cassel 28 : 93. 1881.

var. **sorediatum** Harm. apud Crozals, Bull. Geogr. Bot. **23** : 157. 1913.

Type distributed in Claudel and Harmand, Lich. Gall. Exs. **10** :

474. 1908 without description from La Salvetat (Herault) Fr. MARC. See discussion of *S. pileatum* p. 132.

var. **acaulon** (Nyl.) Oliv. Expos. Lich. Ouest. France **1** : 101. 1897.

S. acaulon Nyl., Flora **59** : 232. 1876.

Type from Limousin, France, LAMY in Mus. Fenn. RIDDLE, after study, states « known from type material only, perhaps worthy of varietal rank. Squamules subturgid, verruciform-conglomerate. » MAGNUSSON reduces it to a form and adds two localities in Smaland and Östergötland.

Stereocaulon confluens Müll. Arg., Flora **67** : 614. 1884.

S. vesuvianum var. *Kilimandscharoense* Steiner, Jahresber. Schles. Ges. Vaterl. Cult. **66** : 134. 1888.

Type from Mt. Gede, Java, 7500 ft., SOLMS, Dec. 1883, in Herb. Boissier.

Podetia caespitose, 1.5-4 cm. tall, 1-1.3 mm. diameter, subsimple or with a few fastigiate branches above, decorticate, glabrous, denuded below ; squamules few, more or less crowded near the tips of the podetia and expanded or foliaceous. Apothecia few, lateral, about 1 mm., plane, with a thin, entire concolorous margin becoming black fuscous. Hypothecium hyaline, spores 4-locular, 38-45 × 2.5-2.5 μ, slightly curved. Cephalodia doubtful.

Authentic specimen of *S. vesuvianum* var. *Kilimandscharoense* from Kilimandjaro, Tanganyika, H. MEYER, com. Steiner in Herb. Boissier. Cephalodia dubious, allied to *S. denudatum,* as if the umbilicate squamules were developed into foliolate forms having the same olivaceous center and pale margin, rather a stunted and deformed plant.

var. **fuscescens** Müll. Arg. Flora **73** : 336. 1890.

Type from Kilimandjaro, 3000-4000 ft., Tanganyika, v. HÖHNEL 204 in Herb. Boissier. Thallus fuscescent (latericius of Saccardo's *Chromotaxia*) similar to the species but with the bushy habit of *S. denudatum* and better developped than the two specimens cited above, although it is sterile.

Stereocaulon congestum Nyl. Ann. Sci. Nat. Bot. IV. **11**: 210. 1858 Syn. Meth. Lich. 252. 1860.

Type from Casapi, Peru, MATHEWS ex Herb. Hooker in Mus. Fenn. duplicate in Mus. Paris.

Podetia 15-20 mm. tall, 0.5-1 mm. in diameter, caespitose, subsimple, rigid decorticate, arachnoid with scattered, verruciform-conglomerate squamules, white but less chalky and more turgid and better developed than in *S. nanum* or *S. albicans,* reaching 0.5 mm. in diameter. Cephalodia and apothecia absent. SPRUCE 44 from the Andes of Peru in Mus. Fenn. is this, only fruticose, fastigiately branched, and much darkened beneath. The cotype specimen in Kew Herb. is sterile and doubtful.

Stereocaulon coralligerum Meyer, Nebenstudien **1**: 156. 1825.

Type from Chile, CHAMISSO, and Brazil, BEYRICH, location unknown. « The cephalodia are cerebriform. » Probably a synonym or segregate of *S. ramulosum*. Since this name antedates many in this group it is hoped that the type may be found and adequately described.

Stereocaulon coralloides Fr., Sched. Crit. Lich. Suec. Exs. **4**: 24. 1817.

S. corallinum Laur. apud Fr., Lich. Europ. 101. 1831 non Schrad. 1794 (*Pertusaria*). *S. paschale* var. *corallinum* Schaerer, lich. Helv. Spic. **6**: 273. 1833.

S. dactyllophyllum Floerke, Deutschl. Lich. **4**: 13. 1819.

S. dactyllophyllum var. *major,* Sommerf., Suppl. Fl. Lapp. Wahlenb. 125. 1826. *S. coralloides* var. *dactyllophyllum* Th. Fr., De Stereoc. et Piloph. Comment 16. 1857. *S. paschale* var. *dactyllophyllum* Branth et Rostr., Bot. Tidssk **3**: 162. 1869.

Type from Sweden, distributed in FRIES Lich. Suec. 118. Notes from copy in Herb. Upsala, « one specimen 2 cm. other 5 cm. tall, 1-2.5 mm. in diameter, podetia subarachnoid, more or less denudate, squamules very distinctly coralline and branched up to 1-2 mm. long ; cephalodia of type of *S. paschale,* small ; apothecia mostly terminal, about 1 mm. in diam. »

RIDDLE mentions specimens from British Isles, France, Tyrol,

Italy, Saxony, Bavaria, Switzerland, Pyrénées, Sweden and North America.

S. Depreaultii Delise apud Nyl., Syn. Meth. Lich. 249. 1860. Type from Newfoundland, DESPRÉAUX in Mus. Paris has stunted material not typical, is certainly either *S. coralloides* or *S. paschale*. An authentic specimen in Herb. Tuck. at Farlow Herb. is *S. coralloides*.

Type of *S. dactyllophyllum* from Rehberger Graben and near Andreasberg in the Harz Mts. also in the Fichtelgebirge 1797 issued in Floerke, Deutsch. Lich. 78, specimens in Brit. Mus.

f. **pumilum** Nyl. apud Harm. Lich. France 361. 1907 ; H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 26. 1926.

Type in Herb. RIPART 108.

« Podetions courts, 7-15 mm. »

var. **occidentale** H. Magnusson, Göteborgs K. Vet. O. Vitterh. Samh. Handl. **30** : 7 : 27. 1926.

Type not mentioned but three specimens cited, also MALME 559.

f. **expansum** H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 28. 1926.

Type near Landvetter, Kokskulla, Västergötland, C. STENHOLM.

Stereocaulon cornutum Müll. Arg., Flora **69** : 252. 1886.

Type Gordon Town, Jamaica, comm. JOSHUA, in Herb. Boissier at Geneva.

Stereocaulon corticatulum Nyl., Flora **61** : 117. 1858.

S. detergens Nyl. Lich. N. Zealand 16. 1888.

Type from New Zealand, COLENSO 5144 Herb. Hooker in Mus. Fenn., cotype in Kew Herb. Cephalodia stalked, minute, tawny, almost even or faintly scrobiculate. Seems to be fairly distinct but much reduced. Material scanty. Good material in KNIGHT, Lich. Nov. Zeland. in Herb. Upsala upon which the following description is based.

Podetia caespitose, 8-20 mm. tall, 0.6-1.5 mm. broad, fruticose, branched either from the base or more commonly above and with short fertile branchlets, rugulose to rimose corticate above, the cortex disappearing below and the podetia smooth, glabrous. No true squamules

present, but above with a few clusters of powdery white granules or soredia, as in *S. Delisei,* contrasting with the tawny podetia. Cephalodia frequent, up to 2 mm. in diameter, occasionally tawny but mostly cinereous, distinctly botryose. Apothecia all terminal, mostly 1 mm. or less, rarely 1.3 mm. always convex and emarginate, badius.

Type of *S. detergens* from Otago, N. Z. in Mus. Fenn. The typical form of *S. corticulatum* and this run into each other not of systematic value. Müll. Arg., Bull. Herb. Boissier **2** : app. 1 : 22. 1894, considered this a variety of *S. corticatulum.*

Stereocaulon cupriniforme Nyl., Flora 48 : 211. 1865.

S. tomentosum f. *cupriniforme* Vainio, Medd. Soc. pro Fauna et Flora Fenn. **6** : 100. 1881.

Type from Asikkala Finland, NORRLIN in Mus. Fenn. is a depauperate specimen of *S. paschale* according to the type of cephalodia. Th. FRIES, VAINIO and OLIVIER have called it a depauperate specimen or a form of *S. tomentosum.*

Stereocaulon curtatum Nyl. Lich. Japon, 18. 1890.

S. octomerum Müll. Arg. Flora 74 : 109. 1891.

Type from tree line, Itchigome, Japan, E. ALMQUIST 1879. in Mus. Fenn. Type of *S. octomerum* Müll. Arg. from Mt. Ontake, MIYOSHI in Herb. Boissier.

The following description is based on the latter specimen. Podetia 17-23 mm. tall, 2 mm. in diam. at the base, very compact, rigid, fastigiately branched and appearing subdendroid, wholly decorticate and glabrous ; squamules crowded, turgid, papilliform to short coralline, mostly 1-1.5 mm. long, simple or occasionally sparingly branched, obtuse, even. Apothecia terminal, 2-3 mm. af first, fuscous, subplane with a thick concolorous margin, then blackening, emarginate, convex and flexuous, cephalodia in irregularly rounded masses, several of which occur in agglomeration, the single mass 1 mm. in diameter, the whole in one case reaching 5 mm., cinereous to nigrescent, distinctly botryose, subsessile « probably with *Nostoc,* hypothecium fuscous, » spores (2-4-) 8-locular, « 33-40 × 6-7 μ. »

Hue, Lich Exot. 309. 1892 states « thalli fibrillae K- vel obsolete flavescunt. »

Stereocaulon curtulum Nyl., Flora 59 : 232. 1876.

S. condensatum Boistel, Nouv. Fl. Lich. 2 : 33. 1903.

Type from La Tache in Auvergne near Mont Dore, LAMY, France. in Mus. Fenn. Depauperate specimens, sterile, indeterminable and of no value. HARMAND has already reached the same conclusion.

Stereocaulon cymosum Crombie, Jour. Linn. Soc. London Bot. 15 : 182. 1876.

Type from Observatory Bay, Kerguelen Island, A. E. EATON 1874-75. in Kew Herb. Since the type was sterile, there has been considerable doubt as to the identity of this species. many authors reducing it ot synonymy with *Argopsis megalospora*. However at Kew in the cover of *S. ramulosum* from Antarctic America are two specimens from Kerguelen Island coll. « J. D. HOOKER, July 1840, on bare rocks 600-1200 ft. above Christmas Harbor » and labeled first *S. paschale* and then *S. corallinum*. They agree much better with the type of *S. cymosum*, than the latter agrees with *Argopsis megalospora*. Cephalodia minute, dark brown, granular sessile, with *Stigonema*. The habit is very distinct in its stout, naked stalk and dense, dendroid habit above. One specimen is well fruited. Apothecia at first concave with a thick concolorous margin, then flat and emarginate, dark brown when mature 1.0-1.5 mm., terminal. In section lecideine, epithecium dark brown, 15 μ ; hymenium hyaline, 60 μ ; hypothecium dark brown, 120 μ thick. Spores hyaline, 6-locular, obtuse, 30-45 × 5-6 μ. The asci staining blue green with iodine, the paraphyses not staining.

RIDDLE adds after a study of *Argopsis Friesiana* Müll. Arg. at Herb. Boissier, « I believe that there are two species, the *Argopsis* having well developped coralline squamules, not at all leprose. » It is evident that the specimens collected by HOOKER are distinct from *Argopsis megalospora* and that if it can be shown that the sterile thallus of the type is a species of *Argopsis*, these will have to receive a new name.

Stereocaulon Delisei Bory de St. Vincent in Duby, Bot. Gall. 2 : 619. 1830.

Type on rocks, forest of St. Sever near Vire, France, DELISE et DESPREAUX in Herb. Bory, other specimens « dedit Bory » in Mus.

Paris. Podetia caespitose, 1.4-2 cm. tall, under 1 mm. in diameter, simple, naked, and glabrous below, with short, fastigiate branches above, where they are densely covered with rounded, conglomerate squamules which mostly dissolve, especially at the tip, into masses of coarse white soredia, not chalky however. Apothecia and cephalodia unknown.

Stereocaulon denudatum Floerke, Deutschl. Lich. 4 : 13. 1819.

S. glaucescens Tuck., Boston Jour. Nat. Hist. 3 : 302. 1841. *S. denudatum* var. *validum* Rabenh., Deutschl. Kryptog. Fl. 2 : 111. 1845.

Type of *S. glaucescens* from White Mts., New Hampshire, TUCKERMAN, 26 June 1839. in Tuckerman Herb. at Farlow Herb.

f. **capitatum** Flotow apud Koerber, Syst. Lich. Germ. 13. 1855.

f. **bracteatum** (Wallr.) Vainio, Meddel. Soc. Fauna Fl. Fenn. 14 : 20. 1888.

Patellaria paschalis var. *bracteata* Wallr., Fl. Crypt Germ. 3 : 442. 1831.

f. **digitatum** Th. Fr., Lichenog. Scand. 1 : 51. 1871.

f. **tenue** Laur, apud Rabenh., Deutschl. Kryptog. Fl. 2 : 111. 1845.

var. **caespitosulum** Nyl., Syn. Meth. Lich. 1 : 247. 1860.

S. denudatum Tuck., Lich Am. Sept. Exs. 5/6 : 114. 1854.

Type based on Tuck. Lich. Am. Sept. 114. from White Mountains, New Hampshire, TUCKERMAN.

var. **depressum** H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. 30 : 7 : 82. 1926.

var. **umbonatum** (Wallr.) Vainio, Meddel. Soc. Fauna et Fl. Fenn. 14 : 21. 1888.

Patellaria paschalis var. *umbonata* Wallr., Fl. Crypt. Germ. 3 : 442. 1831.

S. denudatum var. *compactum* Flotow, Flora 19 : Beiblätter 19 : 55. 1836.

S. paschale var. *pulvinatum* Schaerer, Lich. Helv. Spic. 6 : 274. 1833. *S. denudatum* var. *pulvinatum* Flotow, Bot. Zeitung 8 : 539. 1850.

Type of var. *pulvinatum* Schaerer not found. Specimens at Upsala

cited in Th. Fr., Lich. Scand. have squamules strongly turgid, mostly verruciform, but also partly irregularly umbilicate. It approaches var. *vesuvianum* Pers., from which it is distinct in its rounded, pulvinate habit. It is not at all the granulate squamulose form found in the United States.

f. **arenarium** (Savicz) Zahlbr., Catalogus Lich. Univ. 4 : 645. 1927.

var. *pulvinatum* f. *arenarium* Savicz, Notul. Syst. Inst. Crypt. Hort. Petropol. 2 : 171. 1923.

f. **saxicolum** (Savicz) Zahlbr., Catalogus, Lich. Univ. 4 : 645. 1927.

var. *pulvinatum* f. *saxicolum* Savicz, Notul. Syst. Inst. Cryptog. Hort. Petropol. 2 : 171. 1923.

var. **vesuvianum** (Pers.) Laurer apud Hepp. Lich. Europ. no. 2. 1853.

S. vesuvianum Pers. Ann. Wetterau. Ges. 2 : 19. 1810.

S. graminosum Schaerer in Moritzi, Syst. Verzeichn. 127. 1845.

S. obesum Th. Fr. De Stereoc. et Piloph. Comment. 28. 1857.

S. turgescens Nyl., Syn. Meth. Lich. 248. 1860.

S. violascens Müll. Arg., Rev. Myc. 1 : 164. 1879.

? S. verruciferum Nyl., Syn. Meth. Lich. 248. 1860.

In Herb. Leyden, there are three packets labeled by PERSOON, the one best taken as the type « ex Sicilia » is dewarfed and much congested with squamules either umbilicate or rounded and congested to subcoalescent or coalescent in rounded groups. A second specimen has more of the shrubby habit of *S. denudatum* and small. lateral apothecia, squamules as above, but podetia somewhat tomentose. The third specimen is fragmentary.

S. graminosum from Mt. Pangerango, alt. 9000 ft., ZOLLINGER 1946 is referred to *S. turgescens* Nyl. in Herb. Müller Argau at the Herb. Boissier.

S. obesum from Mt. Irasu, 11,000 ft. Costa Rica, OERSTED in Herb. Upsala, is not separable from *S. denudatum*.

S. turgescens was based on the same collection as *S. graminosum* which name was apparently overlooked by Riddle who merely notes type, in Mus. Paris, has granular squamules densely crowded, habit of *S. denudatum* but coarser, densely stalked, cephalodia olive brown,

verrucose. He was unable to distinguish this (except in distribution) from *S. denudatum* var. *vesuvianum*. NYLANDER also gives as synonym *S. botryosum* Mont. et v. d. Bosch, Lich. Jav. 28. 1857. not *S. botryosum* Ach. apud DC et Lamarck

S. verruciform Nyl. from Colombia, JAMESON in Herb. Hooker at Kew. More robust, squamules as those of *S. denudatum* are coalescent into a group (i. e. compound squamules by agglutination) which may reach 1. or even 2 mm. in diameter. Might well be a habitat condition. *S. denudatum-S. graminosum-S. verruciform* form a series in the compacting of the squamules. In Mus. Paris there is one specimen, collected by BONPLAND in equatorial America, which has the squamules less coalescent and is with difficulty separable from *S. denudatum* v. *vesuvianum*.

var. **vulcani** (Bory) Nyl., Syn. Meth. Lich. **1**: 248. 1860.

Lichen vulcani Bory, Voy. Quatre Iles d'Afrique **1**: 393. 1804 **2**: 147. 1804.

Stereocaulon vulcani (Bory) Ach., Lichenogr. Univ. 583. 1810.

Type from Mauritius, in Herb. Bory, Mus. Paris, is a stunted form with simple podetia, probably not distinct from *S. denudatum* var. *vesuvianum*.

Stereocaulon denudatulum Nyl., Flora **59**: 6. 1874.

Type from Helsingfors. Finland, NORRLIN not found in Mus. Fenn.

Nylander (Flora **60**: 358. 1875) suggest that this is related to *S. condensatum* rather than a dwarf form of *S. denudatum*. The size of spores suggests the latter.

Stereocaulon evolutum Graewe, Bot. Notiser **1865**: 181. 1865.

var. *typicum* Th. Fr. Lichenogr. Scand. **1**: 45. 1871.

Type from Westergotland 1863-64, F. GRAEWE in Herb. Upsala.

Podetia 1.5-2.5 cm. high, 1-2 mm. broad, decorticate and entirely glabrous, denudate at base with abundant and closely set squamules above. Squamules subturgid, well developed, mostly irregularly short coralline, more rarely subdigitate. Cephalodia of the type of *S. paschale*, well developed, over 1 mm. in diameter. Apothecia terminal or subterminal, frequently conglomerate or even subbotryose, the simple apothecia 1.0-2.5 mm. broad.

Stereocaulon exalbidum Nyl., Ann. Sci. Nat. Bot. IV. **11**: 210. 1859. Syn. Meth. Lich. 237. 1860.

Type from San Juan del Oro, Prov. Carabaya, Peru, WEDDELL, June to July 1847 in Mus. Paris and in Mus. Fenn.

Podetia densely but loosely caespitose, 6-10 cm. high, about 1 mm. diam. irregularly branched, wholly decorticate and tomentose, densely covered with squamules which are coralline, terete, simple or branched, 1-5 mm. long (average 2 mm.) slender, wholly tomentose with a distinct tendency to be recurved and flexuous. Apothecia terminal on podetia or branchlets, small (about 1 mm.) hemispherical, badius. Spores 4-6-locular, 35-50 × 3.5-4.5 μ. Hypothecium pale. Cephalodia of the type of *S. ramulosum,* containing *Stigonema.*

Stereocaulon exutum Nyl., Lich. Japon. 18. 1890.

Stereocaulon subramulosum Müll. Arg. Flora **74**: 108. 1891.

Stereocaulon nigrum Hue, Nouv. Arch. Mus. [Paris] III. **10**: 248. 1898.

Type from Mt. Fujiyama, 1650 m., in Mus. Fenn. Type of *S. subramulosum* from Mts. Fujiyama and Ontake, MIYOSKI 1890. in Herb. Boissier. The following description is based upon the two type specimens of *S. subramulosum* supplemented by a specimen from N. S. Wales, Snowy Mts., C. MOORE, which differs only in the squamules being more compressed and the cephalodia paler or even glaucous and is the f. *complanatum* Hue, Nouv. Arch. Museum [Paris] III. **10**: 248. 1898.

Podetia solitary, 4-8 cm. tall from 3 mm. in diameter at the base to 1 mm. or less above, with large ascendent branches from near the base, and with smaller spreading branches above ; wholly decorticate and very glabrous, mostly denuded on one side ; squamules abundant coralline, 1-3 mm. long, repeatedly and variously branched or in the upper part of the podetia subsimple, surface rather smooth, terete or subcompressed, obtuse ; apothecia terminal, frequent, 1.5-4 mm. with an average of 2 mm., fuscous, convex or subflexuous, emarginate. Spores 4-locular, 32 × 4 μ, hypothecium dark brown ; cephalodia in globular, deeply botryose masses which are subpedicellate and reach 2 mm. in diameter, dark cinereous, with *Glococapsa.*

Type of *S. nigrum* from Kiusiu Japan, FAURIE 15389 in Mus. Paris. No sufficient characters to distinguish from *S. subramulosum* from which the chief difference is the darker apothecia, but some of these are not wholly black. As to the spores, note that Hue himself gives the spores of *S. subramulosum* as 28-46 × 4.5-5 μ. In Herb. Hue is a specimen of *S. subramulosum,* as determined by Hue, with wholly black apothecia.

f. **approximans** (Hue) Dodge n. comb. *S. subramulosum* f. *approximans* Hue, Nouv. Arch. Museum [Paris] III. **10**: 248. 1898.

Type from Iidesan Japan FAURIE 862 in Herb. Hue, Mus. Paris. Differs from *S. ramulosum* in cephalodia with *Stigonema.*

f. **complanatum** (Hue) Dodge n. comb. *S. subramulosum* f. *complanatum* Hue, Nouv. Arch. Museum [Paris] III. **10**: 248. 1898.

Type from Yokoska Japan, ONO et SAVATIER 546.

var. **humile** (Müll. Arg.) Dodge, n. comb.

S. subramulosum Müll. Arg. var. *humile* Müll. Arg., Flora **74**: 109. 1891.

Type from Tosa, Japan, MIYOSHI in Herb. Boissier. The single small specimen is scarcely satisfactory, it is not at all the habit of American *S. condensatum* but rather RIDDLE'S conception of *S. japonicum* Th. Fr. the cephalodia, however, being as in the typical *S. exutum,* although scanty. Known only from the single type specimen which is reduced and scanty.

Stereocaulon farinaceum H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30**: 7 : 72. 1926.

Stereocaulon fastigiatum Anzi, Catal. Lich. Sondr. 11. 1860.

S. evolutum var. *fastigiatum* Th. Fr., Lichenogr. Scand. **1**: 45. 1874.

Type from Bormio, Sondria, Italy. Squamules turgid, verruciform and conglomerate, giving a habit similar to *S. alpinum,* but the podetia are glabrous and the cephalodia different.

f. **confluens** H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30**: 7 : 35. 1926.

f. **irregularis** H. Magnusson, l. c. 35.

var. **dissolutum** H. Magnusson, l. c. 36.

f. **congestum** H. Magnusson, l. c. 38.

f. **globuliferum** H. Magnusson, l. c. 37.

f. **simplicior** H Magnusson, l. c. 38.

Stereocaulon foliiforme Hue, Bull. Soc. Bot. France **54** : 414. 1907.

Type from Japan, FAURIE 6746, 6999. Hue at Mus. Paris. Squamules areolate-diffract, the ashy-glaucous center and whitened edges reminding of *S. denudatum*. The branched, naked podetia grow in a dense mat and bear above the foliolate expansions, which have their edges turned up and are thickened resembling the type of *S. Wrightii*. When separated out, the two appear distinct.

Stereocaulon foliolosum Nyl., Syn. Meth. Lich. 240. 1860.

Type from Himalayas, JACQUEMONT 743 in Mus. Paris, fragment in Mus. Fenn.

Podetia loosely caespitose and rather loosely attached to the soil, 2-4 cm. tall, about 1 mm. in diameter, decorticate and faintly subtomentose, specially above, dividing from near the base into long ascending branches with a few shorter branches above, straight or irregular, flexuous. Squamules abundant, coralline, simple or more often subdichotomous or irregular, 1-3 mm., the larger flattened and more or less expanded, foliolate and crenate, surface rugose, underside pale. Apothecia terminal, 1.5-3 mm. castaneous, at first flat and margined, but very soon emarginate and strongly convex, more or less flexuous. Hypothecium pale but obscure, or almost fuscescent. Spores (immature in specimen examined) 14-16-locular, 100 × 4-4.5 μ (teste Nyl). Cephalodia about 2 mm. diameter, dark tawny, similar to *S. ramulosum* but deeply botryose with globular divisions, containing *Chroococcus*.

Note the relationship of this, on the one hand to *S. ramulosum* var. *compressum* Churchill Babington from which it differs in the cephalodia and the elongated spores ; and on the other hand to *S. botryophorum* from which it differs in the foliolate squamules and the more slender podetia and less rigid habit.

Stereocaulon glabrum (Müll. Arg.) Vainio, Résult. Voy. S. Y. Belgica Bot. 16. 1903.

S. alpinum var. *glabrum* Müll. Arg. in Hariot, Miss. Cape Horn 151. 1888.

Type from Orange Bay, Cape Horn, HYADES in Herb. Boissier, is scanty and depauperate, no cephalodia present.

Stereocaulon glareosum (Savicz) H. Magnusson, Göteborgs K. Vet o. Vitterh. Samh. Handl. **30** : 7 : 60. 1926.

Stereocaulon tomentosum f. *glareosum* V. P. Savicz, Izvest. Imp. Bot. Sada Petra Belikago **14** : 121. 1914.

Type from banks of Sczapina R., Kamchatka, Siberia, SAVICZ.

Stereocaulon gracillimum Müll. Arg. Flora **64** : 505. 1881.

Type from Hakon Mt. near Miyanoshita, Japan, BRAUNS 11, in Herb. Boissier. Known only from the type consisting of 9 small, simple, depauperate podetia.

Stereocaulon humile Müll. Arg., Bull. Herb. Boiss. **4** : 88. 1896.

Type from Victoria, Australia, C. KNIGHT 60, 1887. in Herb. Boiss. A single specimen which evidently grew under severe conditions.

Podetia glabrous, and decorticate below, with squamules in the form of minute, congested granules massed near the top of the podetia, occasional squamules better developed and giving evidence of relationship with *S. alpinum*. Cephalodia of the type of *S. tomentosum*. Sterile.

Species dubia, but characters distinct and may be admitted provisionally.

Stereocaulon incrustatum Floerke, Deutschl. Lich. **4** : 12. 1819.

S. tomentosum var. *incrustatum* Schaer. Lich. Helv. Spicil. **6** : 276. 1833.

Type distributed in Floerke, Deustch. Lich. 77 in Herb. van der Bosch at Leiden studied, also one in British Museum.

Podetia 2-3.5 cm. high, stout, caespitose, growing in sandy soil, densely covered with a beautiful, continuous, spongy tomentum, with occasional, short and more or less squarrose branches ; squamules turgid, conglomerate, verruciform and more or less covered with the tomentum ;

apothecia terminal or lateral, normal or conglomerate ; cephalodia erumpent, subglobose, dark brown, rather smooth, reaching 2 mm. in diameter. The wholly verruciform squamules and the tendency to squarrose branching seem the most distinctive characters. Perhaps best considered a variety of *S. tomentosum*.

S. intermedium (Savicz) H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 23. 1926.

S. coralloides f. *intermedium* Savicz, Not. Syst. Inst. Crypt. Hort. Petropol. 2 : 163. 1923.

Stereocaulon japonicum Th. Fr., De Stereoc. et Pilophor. Comment. 18. 1857.

Type : Japan, THUNBERG in Thunberg Herb. at Upsala.

Podetia caespitose, 12-15 mm. high, subtomentose, the persistent basal squamules more or less coralline branched, reaching 2 mm. in length, the upper merely papilliform and under 1 mm. Cephalodia up to 1.2 mm. in diameter. Otherwise all the characters as described for *S. uvuliferum* Müll. Arg.

Stereocaulon lecanoreum Nyl., Flora **41** : 117. 1858.

Type from Antioquia, Colombia, WILLIAM LEWIS in Herb. Kew. dup. in Mus. Paris and fragment in Mus. Fenn.

Podetia solitary, 4-7 cm. tall, 1.5-2 mm. thick, simple below, sparingly divaricately branched above, decorticate and distinctly tomentose ; squamules few and scattered, subabsent in the lower half of the podetia, coralline, subsimple, terete, 1 (-2) mm. in length, acute. Apothecia brown-black, 1.2-2 mm. broad, terminal or lateral and stipitate, plane or somewhat convex with a crenulate pseudothalline margin which ultimately becomes very thin ; sometimes containing algal cells beneath the hypothecium, but these are not constant ; hypothecium deep brown, spores (6-8-locular, 72-80 × 5 μ teste Nyl.) straight. Cephalodia of the type of *S. ramulosum,* containing *Chroococcus.*

In specimen from Colombia, Santa Marta, Sierra Nevada, G. WALLIS in Herb. Boissier, the apothecia are without algae, the hypothecium deep fuscous and the spores 8-locular, 50 × 4 μ to 55 × 4.5 μ.

Stereocaulon leprocephalum Vainio, Ark. f. Bot. 8 : 4 : 35. 1909.

S. evolutum Almquist Lich. Iaktt. Sib. 48. 1879 non Graewe.

S. condyloideum Nyl. Act. Soc. Sci. Fenn. 26 : 10 : 5. 1900 not Ach.

Type from Siberia, Jinretlen Peninsula, Pitlekai, ALMQUIST as *S. evolutum* sterile. The *S. condyloideum* Nyl. came from Ceylon, Pedrotalegalle, E. ALMQUIST in Mus. Fenn. Herb. Nyl. 39878, fertile.

Stereocaulon leptaleum Nyl. Syn. Meth. Lich. 251. 1860.

Type from Tasmania ex Herb. Hooker in Mus. Fenn. is so much reduced, so scanty and sterile, that the species is worthless.

Stereocaulon macrocarpoides Nyl. Syn. Meth. Lich. 238. 1860.

Type from Tasmania (Herb. Hook.) and Chile, GAY. both in Mus. Fenn. in Herb. Nylander ; material from Chile, GAY also in Mus. Paris.) In all respects like a small specimen of *S. macrocarpum* except cephaloda. ZAHLBRUCKNER places this as *S. ramulosum* var. *macrocarpoides* (Nyl.) Hue.

Stereocaulon macrocephalum Müll. Arg., Flora 74 : 371. 1891.

Type from North West India, British Garwhal Bhowani, 12,000-14,000 ft. J. F. DUTHIE 5227 in Herb. Kew.

Podetia solitary, closely adherent to the rocks, 15-40 mm. tall, 1.5-2 mm. in diam. simple or sparingly furcate, or with several short, fertile, fastigiate branches at the tip ; rugose to foveolate corticate, glabrous ; squamules crowded, spreading, secund, stiff, turgid, attenuated to a subacute tip, simple or nearly so, smooth but minutely foveolate, 2-3 mm. long ; apothecia terminal 2.5 (-6 mm. in a specimen coll. Hooker) developing in pyriform, thalloid, tubercles, then open, strongly convex and emarginate, black or nearly so. Spores 20-30-locular, 200 × 5 μ, spirally curved, Cephalodia subsessile, globose, about 0.8 mm. foveolate, olivaceous.

Appears to be a very distinct species, the podetia strigose with the secund, stout squamules and the very large terminal apothecia. The small cephalodia are of the general type of *S. ramulosum* but sessile. ZAHLBRUCKNER reduces this to synonymy with S. *piluliferum*.

var. **yunnanense** (Hue) Dodge, n. comb.

S. claviceps var. *yunnanense* Hue, Nouv. Arch. Mus. [Paris] III. 10 : 251. 1898.

Type from Yunnan China, DELAVAY in Mus. Paris, taller, 4-7 cm., stouter and squamules less well developed than in the typical form ; cephalodia with *Gloeocapsa*.

var. **strictum** (Churchill Babington) Dodge n. comb.

Stereocaulon strictum (Bab.) Nyl., Syn. Meth. Lich. **1** : 239. 1860 not Th. Fr. 1857.

Stereocaulon ramulosum var. *strictum* Churchill Babington, Hooker's Journ. Bot. **4** : 250. 1852.

Type from Himalayas, Madhari, Kumaon, 8200 ft., STRACHEY et WINTERBOTTOM, in Churchill Babington's Himalayan Herb. 25 in Herb. Cambridge Univ. Podetia 2.5-4 cm. high, sparingly branched ; squamules terete, obtuse, simple or subsimple, spreading (scarcely as dense or as secund as in *S. macrocephalum*). Cephalodia sessile, subglobular, olivaceous. Apothecia terminal, up to 2 mm. in diameter.

RIDDLE'S notes are not clear as to whether he intented to treat this as a separate species or not. The notes are not dated and it becomes impossible to know which of his conclusions were written after he had studied all the specimens involved. Since the recognition of this species would involve a new name, I have preferred to leave it as a variety but to transfer it from *S. ramulosum* to *S. macrocephalum* with which it is evidently closely related. ZAHLBRUCKNER refers both *S. macrocephalum* and *S. strictum* (Bab.) Nyl. to *S. filuliferum* Th. Fr.

The type distribution was evidently mixed material, since type material in Kew Herb. under this number has cephalodia waxy, smoothish when small, botryose when larger, sessile; not of the same texture as the squamules nor scrobiculate, as in typical *S. ramulosum*.

Stereocaulon Massartianum Hue, Nouv. Arch. Mus. [Paris] III. **10** : 252. 1898.

Type from Java, MASSART in Herb. Hue, Mus. Paris. RIDDLE was unable to separate this species from *S. nesaeum* in any characters except the contents of the cephalodia (with *Stigonema* instead of *Scytonema*).

Stereocaulon microcarpum Müll. Arg., Flora **62** : 162. 1879.

Type from Apiahy, Brazil, PUIGGARI 151 in Herb. Boissier.

Podetia 17-25 mm. high, 1-1.5 mm. broad, solitary, sparingly branched, rugose and partly rimose-corticate or sometimes corticate-areolate

and then arachnoid near the areoles ; when the tips are sterile, they are capitate and whitened (soredia ?) ; squamules absent or nearly so, except at the base of the podetia, where there are a few elongated (3-5 mm.) coralline, terete, simple or furcate squamules which are rugulose and obtuse (in the Jamaican specimens these are absent from the base but occur sparingly and less developed in the middle portion of the podetia : apothecia terminal or clustered at the tip of the podetium and then partly lateral, 0.6-1 mm., blackish-fuscous, at first nearly plane and with a thickish, paler margin, then convex and emarginate. Hypothecium pale. Cephalodia stalked, sessile or even concrescent with the 1-1.5 mm. (the concrescent ones more extended), scrobiculate, convolute cortex of the podetia with which they are concolorous or subolivaceous, or even subcerebriform, containing *Stigonema*. Spores straight, acute, at one end, obtuse at the other, 4-locular, 50 × 4 μ .

The Jamaican specimens referred to above are from the Blue Mts. Rev. H. HIGGINS, Nov. 1876.

Stereocaulon mixtum Nyl., Syn. Meth. Lich. 238. 1860.

No definite type specimen cited, mountains in Mexico, West Indies, Nova Granata (Colombia), Bolivia and Hawaii mentioned. Material in the Mus. Paris determined by NYLANDER, Hawaiian Islands, GAUDICHAUD is var. *denudatum* Pers. while LINDIG 2501, and J. GOUDOT 1844 from Colombia and WEDDELL 1845 from Prov. de la Cordillera, Bolivia are the typical form. Specimens from Mexico and the West Indies determined by Nylander were not seen.

var. **denudatum** (Pers.) Müll. Arg. Flora 72 : 60. 1889.

Stereocaulon denudatum Persoon apud Gaudichaud, Voy. Uranie 211. 1826 non Floerke 1819.

Type of *S. denudatum* Pers. from Hawaiian Islands, GAUDICHAUD in Herb. Persoon at Leiden. The specimens are entirely destitute of squamules, podetia subcorticate especially above, cephalodia small.

var. **sorediatum** Nyl. Syn. Meth. Lich. 239. 1860.

Type from Orizaba, Mexico, GALEOTTI 6921.

var. **tenellum** Müll. Arg., Flora 63 : 260. 1880.

Type from Apiahy, Brazil, PUIGGARI 151 p. p. in Herb. Boissier.

Podetia 2-3 cm. tall about 1 mm. or less in diameter, squamules reduced on upper part of podetia ; podetia decorticate.

Stereocaulon myriocarpoides Nyl., Syn. Meth. Lich. 245. 1860.

Type : Himalayas, J. D. HOOKER et THOMSON 2170 in Kew Herb. and Mus. Paris. It closely resembles *S. alpinum,* differing in the cephalodia or the *S. paschale* type and in the podetia being subglabrous. The plant has the habit of *S. myriocarpum,* occasionally tending toward a crenate condition, apothecia lateral, small, numerous

Stereocaulon myriocarpum Th. Fr., De Stereoc. et Pilophor. Comment. 15. 1857.

Type : Pelado n. Sierra de Oajaca, alt. 9,000-10.000 ft. LIEBMANN in Upsala Herb.

Closely related to *S. coralloides* and to *S. myriocarpoides.* From the former it differs in being distinctly tomentose and with the apothecia small and lateral and generally numerous. From the latter it differs in the podetia being more tomentose and the squamules more coralline instead of granulate-conglomerate. All there species have large cephalodia of *S. paschale* type.

Stereocaulon nabewaziense A. Zahlbruckner, Ann. Myc. **14** : 56. 1916. Yasuda, Bot. Mag. Tokyo **29** : 320. f. 1.-2. 1916 (in Japanese).

It is quite possible that specimen from Mt. Fiji, Japan, MIYOSHI, determined by MÜLLER ARGAU as *S. cornutum,* which puzzled RIDDLE on his visit to the Herb. BOISSIER should be referred here.

Stereocaulon nanodes Tuckerman, Am. Jour. Sci. 28 : 201. 1850.

Type specimens from Crystal Falls, Saco Falls and upper gorge of the Ammonoosuck in the White Mountains, TUCKERMAN in Tuckerman Herb. at Farlow Herb.

Primary thallus absent ; podetia about 1 cm. tall, dendroid branched, glabrous, more or less denuded ; squamules in the form of small, rounded granules dissolving into fine, whitish powder (but not chalky as in Sect. Chondrocaulon) ; apothecia terminal or absent and the podetia ending in masses of soredia. Spores 24-42 × 2.5-3 μ.

Stereocaulon nanum Ach. Meth. Lich. 315. 1803.

? S. quisquiliare Hoffm. Deutschl. Fl. 2 : 130. 1795.

Lichen nanus Ach. Prodr. 206. 1798.

Lichen quisquiliaris Leers Fl. Herb. 264. 1775 ; ed. 2, 267. 1789 included depauperate *Cladonia squamosa* and hence is untenable by the International Rules.

Lichen microscopicus Vill., Hist. Pl. Dauphin. 3 : 946. 1789 is referred here by Krempelhuber, Geschichte Lichenol. 2 : 538. 1869.

S. nanum var. *pulverulentum* Th. Fr. De Stereoc. et Pilophor. Comment. 37. 1857.

The syonymy of this species and its relationships must remain doubtful in the absence of apothecia. Since practically all lichenologists except SCHAERER, RABENHORST and ZAHLBRUCKNER have used *S. nanum* for this plant, it seems wiser to continue this name, at least until the application of the older names can be substantiated by a study of type specimens.

The type of *S. nanum* from Switzerland and Sweden, in Herb. Acharius at Mus. Fenn., has squamules partly mealy and partly dissolving into a cottony condition

This species has been taken as the type of a new genus, *Leprocaulon* by NYLANDER apud LAMY, Bull. Soc. Bot. France 25 : 372. 1878 and as section *Chondrocaulon* Th. Fr. De Stereoc. et Pilophor. Comment. 36. 1857.

BLOMBERG, Bot. Notiser 92. 1895. attempted to show that this was the sterile state of *Cladonia digitata* and DU RIETZ apud MAGNUSSON, K. Vet. o. Vitterh. Samh. Handl. 30 : 7 : 85. 1926 that it was a state of *C. coccifera.*

f. **mundum** Th. Fr. De Stereoc. et Pilophor. Comment 37. 1857.

S. nanum Fr. Summa Veg. Scand. 1 : 109. 1846.

Type from Norway. Not seen.

This is placed in the group with verruciform or granular squamules by FRIES who considered the leprose condition as a monstrosity. When the type is studied it will probably fall into synonymy in the *S. fastigiatum* group.

Stereocaulon nesaeum Nyl. Syn. Meth. Lich. 240. 1860.

Type from Java, ZOLLINGER 885 ; Philippine Islands, CUMING 2183. in Mus. Paris. Podetia solitary, 5-6 cm. tall, 1-2 mm. in diameter, simple below or with 1 or 2 long ascending branches, repeatedly branched above, especially near the tip and branches short and spreading, often subdendroid, wholly decorticate (in specimen from Tahiti, VIELLARD 26 in Herb. Upsala det. Nylander, partially scattered corticate) delicately but distinctly tomentose, without squamules on on side. Squamules not abundant, coralline, terete, acute, below repeatedly unequally branched and reaching 5 mm. becoming reduced above, simple and under 1 mm. surface smooth, the main part of the larger squamules more or less arachnoid, all very slender (about 0.5 mm. in diameter) flexuous. Apothecia frequent, terminating branchlets, developing in pyriform tubercles, then expanded, hemispherical and emarginate, about 1 mm. in diameter, badius. Hypothecium hyaline, spore multilocular, spirally contorted, 100-150 × 4-5 μ. Cephalodia 1 mm. or less, tawny to olivaceous, of the type of *S. ramulosum,* containing *Scytonema.*

Especially abundant in the East Indies. Entirely distinct from *S. macrocephalum* Müll in the slender, branched squamules, which are not at all strigose, and in the small apothecia.

var. **lecideoides** Vainio, Philip. Jour. Sci. 4 : 662. 1909.

Four specimens cited from the Philippine Islands, none designated as type. « Apothecium at first with thalline margin, at length lacking algae » otherwise as in *S. nesaeum* var. *zeorina* Vainio.

var. **zeorina** Vainio, Philip. Jour. Sci. 4 : 661. 1909.

Four specimens cited from the Philippine Islands, none designated as type, « parathecium of radiating, thick-walled, agglutinating hyphae, semipellucid, narrowly naked margin surrounded by an amphithecium containing algae. Interior of Chondroid axis and outside of podetia KOH yellow, apothecia KOH yellow, hymenium and hypothecium becoming orange red. The descriptions of these varieties suggest reference to *Lecanocaulon.*

Stereocaulon obscurum Müll. Arg., Flora 74 : 109. 1891.

Type, covering lava fields Cameroun Mt. 5,000-12,000 ft. West

Africa Dec. 1862 E. MANN. 15 type in Kew and Herb. Boissier scarcely offers any characters to distinguish it from *S. denudatum* except the color. The largest specimen in Stenh. Lich. Suec. no. 83, in Herb. Kew, of *S. denudatum* has almost exactly the same coloring.

Stereocaulon octomerellum Müll. Arg., Nuov. Giorn. Bot. Ital. 24 : 190. 1892.

Type from Japan in Herb. Boissier much reduced and unsatisfactory.

Stereocaulon Orizabae (Th. Fr.) Vainio, Dansk. Bot. Ark. 4 : 11 : 7. 1926.

Stereocaulon myriocarpum var. *Orizabae* Th. Fr. De Stereoc. et Pilophor. Comment. 15. 1857.

Type from Orizaba Mt. 12,000 ft. Mexico, LIEBMANN. in Upsala Herb.

Podetia 3-4 cm. high. The best difference from *S. myriocarpum* is that in this species the podetia are only sparingly branched and may even appear simple above and caespitose, as in true *S. denudatum*.

Stereocaulon pachycephalum Vainio, Dansk. Bot. Ark. 4 : 11 : 7. 1926.

Stereocaulon paschale (L.) Hoffm. Deutschl. Fl. 130. 1796.

Lichen paschalis L., Sp. Pl. 1153. 1753.

Type in Herb. Linn. Soc. London. There are six sheets of this species as follows : 1. name, Sp. Pl. no. 68, and Fl. Suec. no. 982, all in handwriting of LINNÉ, bears eight specimens, the center one, large and fine, is certainly as generally undertood, the others are smaller and less typical. 2. labeled by LINNÉ f. has four sterile and uncertain specimens which appear to be *S. evolutum* Graewe. 3. labeled by LINNÉ f. has three podetia of *Lichen salazinus* Bory. 4. labeled by LINNÉ f. has nine specimens, some small and agreeing with those on sheet one. 5. one specimen labeled by EHRHART. 6. labeled first by LINNÉ, then by his son, has one specimen of *S. ramulosum*.

var. **conglomeratum** Fr. Sched. Crit. ad Lich. Suec. Exs. 3 : 20. 1824.

Specimens distributed in FRIES, Lich. Suec. 89. In copy at Herb.

Upsala, podetia crowded and compact or looser and somewhat shrubby, 2-3.5 cm. tall, wholly glabrous and more or less denuded. Squamules typical of the species, apothecia subterminal, 1.5-2.5 mm. broad, less depauperate than in New England material.

var. **evolutoides** H. Magnusson Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 50. 1926.

var. **gracilentum** Th. Fr. De Stereoc. et Pilophor. Comment. 33. 1857.

Type from island of Faro near Gotland, Sweden, STENHAMMAR. in Herb. Upsala, merely a growth form of *S. paschale*. An erect form, differing from var. *vulgare* which occurs especially among Cladoniae or Musci in being much more branched. Both var. *vulgare* and v. *gracilentum* are more or less denudate and generally very glabrous. MAGNUSSON places this variety under *S. alpinum*.

var. **grande** H. Magnusson, Göteborgs K. Vet o. Vitterh. Samh. Handl. **30** : 7 : 49. 1926.

var. **serpens** Th. Fr., De Stereoc. et Pilophor. Comment. 33. 1857.

Type from Upsala, Sweden, in Herb. Upsala. Habitat form, scarcely of systematic value, represented by type specimen only. A spreading decumbent form, similar to var. *conglomeratum* but with more slender podetia and squamules small, more granuliform, less digitate.

var. **taeniarum** H. Magnusson, Götbeorgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 48. 1926.

Although I have not seen the types of most of the varieties and forms, they seem to be of little value and not based upon a study of sufficient material to warrant their acceptance. It may be noted that Th. FRIES did not take trouble to separate his varieties in his own herbarium. Much physiological and ecological work needs to be done before the systematist can properly evaluate the variation due to the physical factors of the environment.

Stereocaulon pileatum Ach. Lich. Univ. 582. 1810.

S. condensatum Laur. apud Fr., Lich. Europ. 203 p. p.

S. cercolus Schaer. Enum. 178. 1850, not Ach. Meth. 316. 1803.

S. cereolinum Koerber, Syst. 14. 1855 non Ach. Syn. 285. 1814 according to specimens in Herb. Koerb. at Leiden.

S. cereolinum var. *pileatum* Th. Fr. De Stereoc. et Pilophor. Comment. 19. 1857.

Type from Switzerland, SCHLEICHER in Herb. Acharius, Mus. Fenn. consists of 5 well developed podetia 5, 6, 7, 10, 15 mm. tall, best 1-2 mm. diam. There are simple, two fastigiate with three and four short branches. Four end in apothecia, one appearing broken, none capitate sorediate. Apothecia 1.2, 1.6, 1.8, and 2 mm. in diameter, af first distinctly marginate then the margin becoming very thin, more or less flexuous, and apothecia becoming convex. Primary squamules too poor for description. Squamules on one podetium distinctly coralline, on the other four granular and rather fine. The specimens look as if they might have been broken off a rock substratum, although one specimen has sandy soil still adhering to the base.

A second specimen, on earth from Sweden, in Herb. Acharius not mentioned in the original description, has some podetia capitate sorediate, squamules more granular and is on earth. This specimen would seem to belong to *S. condensatum* var. *sorediatum*.

It will be seen from the above description of the type that this species is very close to *S. condensatum*. When RIDDLE (1910) tabulated the characters of these two species, he had not seen the type. Of the characters he enumerates, the reduced character and the capitate-sorediate tips of podetia are not evident in the type. The spores of the type were not studied ; leaving only the coralline character of the squamules and the habitat to separate this species from *S. condensatum*. MAGNUSSON (1926) also without seeing the type, independently came to the same conclusions as RIDDLE (1910). If we retain *S. pileatum* as distinct, what RIDDLE and MAGNUSSON considered the typical form should be included in *S. sorediiferum* Nyl. apud Kieffer. Forma *terrestre* Harmand perhaps should be transferred to *S. condensatum*.

My present inclination would be to consider *S. pileatum* as a synonym of *S. condensatum* and then attempt to separate the varieties and forms which have been proposed in both species. However, since I have not had an opportunity to study the types of most of these varieties, I prefer not to make new combinations at present. Therefore

I have omitted consideration of all of these varieties and forms from my key.

f. **macrum** H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 70. 1926.

f. **ramificans** H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 71. 1926.

f. **sessile** H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 71. 1926.

f. **sorediiferum** Nyl. apud Kieffer, Bull. Soc. Hist. Nat. Metz **19** : 13. 1895.

No type cited but issued in HARMAND, Lich. Loth. 165.

f. **terrestre** Harm., Lich. France **3** : 369. 1907. (nom. nud.)

Type not cited.

Reported from bare silicious soil.

Stereocaulon pilophoroides Tuckerman, Proc. Am. Acad. Arts Sci. **6** : 265. 1864.

Type from Hawaiian Islands, W. HILLEBRAND in Tuck. Herb. at Farlow Herb. With the aspect of *Pilophorus,* but apothecia, spores and spermatia of *Sterocaulon ;* stock f. *S. ramulosum.* Podetia 10-12 cm. high, stout, dividing into 2-3 long branches above midlle which send out irregularly, short branchlets terminated by the subglobose, black apothecia. Phyllocladia more or less confluent, especially above, but passing into papillae which, toward the base, are elongated and terete. Hypothecum blackish brown. Spores 50 × 5 μ.

Stereocaulon piluliferum Th. Fr., De Stereoc. et Piloph. Comment. 21. 1857.

Podetia solitary, 15-30 mm. tall, 0.5-0.8 mm. in diameter, simple or with a few (1 or 2) short branchlets, the main axis remaining evident, decorticate, except occasionally at the top, and subglabrous, mostly thickly covered with squamules from base to tip, but these usually unilateral. Squamules slender, terete, acute ; below 1-2 mm. long, simple or once forked, subflexuous ; above simple, papilliform, under 1 mm., more rigid and distinctly strigose. Cephalodia as in *S.*

claviceps but more olivaceous. Apothecia all terminal on the podetia or branchlets, 1-1.8 mm. in diameter, development and characters as in *S. Claviceps* but cinnamon black and rugulose, spores 64-70 × 2.5-3 μ

Description based on 3 specimens in Herb. Th. Fries at Upsala : Nepal, WALLICH, type but very poor ; Nepal ex herb. SCHAERER ; East India com. HOOKER.

Stereocaulon pityrizans Nyl., Ann. Sci. Nat. Bot. IV. **11** : 209. 1859.

Type from Province of Carabaya Peru, WEDDELL, June-July 1847 in Museum Paris. Apothecia with pseudolecanorine margin, but no trace of algae seen. Hypothecium dark badio-brown. No spores in the apothecia sectioned. Specimens labelled this in Herb. Tuck from Jamaica seem to be *S. cornutum* Müll. Arg.

Podetia densely caespitose, 2-4 cm. tall, 1.5-2 mm. thick but appearing stouter on account of the dense covering of squamules, rather rigid, attenuate above and more or less nutate, simple or nearly so, decorticate, subtomentose ; squamules umblicate with dark centers ; minute, 0.2 mm. in diameter but crowded into subpedicellate groups, uniform or nearly so throughout. Apothecia lateral, 1-1.5 mm. broad with a persistent pseudo-thalline margin (no algae present in the one examined) becoming flexuous, flat to subconvex. Hypothecium dark brown, spores 2-4-locular, 24-26 × 3-3.5 μ. Cephalodia doubtful.

Certainly closely related in habit to *S. cornutum* but distinct in the minute squamules not becoming foliose and in the marginate apothecia. Also closely related to *S. denudatum*.

Stereocaulon prostratum Zahlbruckner, Bot. Mag. Tokyo **41** : 340-341. 1927.

Type from Japan, prov. Mutsu, Mt. Hakkoda, ASAHINA 149, not seen.

Stereocaulon proximum Nyl., Syn. Meth. Lich. 237. 1860.

Type specimen not definitely cited ; from mountains of Mexico, Nova Granata [Colombia LINDEN, 866 and 1005], Peru, Bolivia, and Venezuela [LINDEN 385, Voy. de F. et Schlim, Galipan]. Müll. Arg.

Flora **70**: 286. 1887 places *S. furcatum* Fr. here rather than as a synonym of *S. ramulosum*.

f. **sorediatum** Nyl. Syn. Meth. Lich. 237. 1860.

No specimens cited, but material in Mus. Paris so determined by NYLANDER is WEDDELL, Prov. Yungas, Bolivia 1846, and WEDDELL, Prov. Carabaya, Peru 1847. In these the squamules are absent except at base of podetia.

var. **compressum** Nyl. Syn. Meth. Lich. 237, 1860.

Type from Nova Granata, GOUDOT 1844 in Mus. Paris.

Sparingly branched; squamules in lower part of podetia typical; at tips of podetia, flattened, expanded and foliaceous, about 5 mm. long and 1.5-3 mm. wide, underside veined and with white, granular soredia, margins flexuous crispate. Colombia, Antioquia, WALLIS, and Andium Portoensium, ED. ANDRÉ, 3269 both in Herb. Müll. Argau, Colombia LINDIG 2500 in Herb. Kew.

var. **gracilius** Müll. Arg., Rev. Myc. **1**: 164. 1879.

Type from near Dolores, Colombia, ED. ANDRÉ 2813 p.p. in Herb. Boissier. Merely a small form of *S. proximum* but not reduced, typical in everything but size.

f. **ferruginascens** Müll. Arg. Hedwigia **30**: 220. 1891.

var. **nudatum** Müll. Arg. Flora **69**: 253. 1886; apud Shirley in Bailey, Queensland Dept. Agr. Bull. **9**: 21. 1891; Jour. Linn. Soc. Bot. **32**: 199. 1896.

Type from Brogers Creek, Australia, BAUERLEN 10 in Herb. Boissier. Upper part with a few typical squamules; cephalodia olivaceous in type but in other specimens they are partly olivaceous and partly concolorous. In specimen from Victoria, LACHMANN, podetia mostly devoid of squamules, smooth and polished, branching.

f. **Traversii** Hue, Nouv. Arch. Mus. [Paris] III. **10**: 245. 1898.

Type from New Zealand, Sir LOCKE TRAVERS in Mus. Paris merely a dendroid branched form.

var. **compactius** Zahlbruckner apud Skottsberg, Nat. Hist. Juan Fernandez **2**: 373. 1924.

Stereocaulon pygmaeum Vainio, Résult. Voy. S. Y. Belgica Bot. 15. *pl.* 2. *f.* 9. 1903.

Stereocaulon ramulosum (Sw.) Raeuschel, Nomenclat. Bot. ed. 3. 328. 1797.

Lichen ramulosus Swartz, Nov. Gen. Sp. Plant. 147. 1788.

S. laccatum Fr., Syst. Orb. Veg. 285. 1825.

S. furcatum Fr., Syst. Orb. Veg. 285. 1825.

S. ramulosum var. *elegans* Th. Fr. De Stereoc. et Piloph. Comment. 11. 1857.

Specimen from Jamaica, SWARTZ in Herb. De Candolle 4 cm. high, podetia branched, more or less corticate and with very few squamules, those present typical, apothecia all terminal, cephalodia small typical. Material in Herb. Ach. fragmentary but probably *S. mixtum.*

RIDDLE finally drew up the following description : A medium size to robust plant, podetia usually branching from the base, curved upwards and still more branched above ; verrucose-corticate to decorticate, naked or arachnoid ; squamules mostly abundant, coralline, simple or sparsely branched, spreading, terete ; cephalodia stalked, medium, more or less globular, scrobiculate, concolorous ; apothecia always terminal, abundant and medium to large.

Type of *S. laccatum* from Straits of Magellan. Teste Th. Fr. this species was based on a degenerate specimen of *S. ramulosum.*

Type of *S. furcatum* Fr. from West Indies in Herb. Upsala. Müller Argau, Flora **70** : 286. 1887 states that this is *S. ramulosum* Ach. or *S. proximum* but is distinct from *S. virgatum* Ach. Nylander Syn. Meth. Lich. 235. 1860 states « *Lichen ramulosus* Sw., Fl. Ind. Occ. **3** : 1917 e Jamaica, sistat *S. furcatum* Fr. quod inde adest nomine illo, missum à Swartz ipso in hb. Hookeriano. » RIDDLE, after a study of the specimens cited confirmed these opinions. This species has sometimes been used as a synonym of *S. virgatum* Ach.

Type of *S. ramulosum* var. *elegans* Th. Fr. from Straits of Magellan, ANDERSSON in Herb. Upsala is a stout typical form well covered with squamules.

var. **vimineum** Nyl., Ann. Sci. Nat. Bot. IV **11** : 209. 1859 nom. nud. Syn. Meth. **1** : 236. 1860.

Type from Bolivia Yungas WEDDELL regarded by NYLANDER later as a small form of *S. ramulosum* based on a misidentification of this material as *S. vimineum* Th. Fr.

var. **acuminatum** Müll. Arg., Flora **73**: 335. 1890.

Type from Mt. Kilimandscharo, 3000 m. v. HOEHNEL 208. in Herb. Boissier. Podetia simple above and attenuate and variously curved, white powdery (not at all capitate-sorediate, however). Habit of growth of *S. cornutum*, podetia subsimple and distinctly attenuate; upper squamules absent and the lower squamules and cephalodia as in *S. ramulosum*.

var. **compactum** Müll. Arg., Bull. Herb. Boiss. **4**: 87. 1896.

Type from Queensland, Australia, SHIRLEY 1738. in Herb. Boissier, is a reduced and congested form of doubtful value.

var. **compressum** Churchill Babington in Hooker f., Fl. New Zealand **2**: 294. 1855.

Type from North Island, New Zealand, COLENSO in Herb. Cambridge Univ. Podetia 3 cm. tall, sparingly branched above, simple below, esquamulose and appearing rugulose corticate. Squamules abundant above, much branched and foliolate-compressed. Other characters as in *S. ramulosum*.

var. **farinosum** Th. Fr., De Stereoc. et Piloph. Comment. 12. 1857.

Stereocaulon Meyeri Steiner, Jahresber, Schles. Ges. vaterl. Cultur **66**: 134. 1888.

Type from Orizaba, Mexico, LIEBMANN in Herb. Upsala is typical of *S. ramulosum* in habit but almost devoid of squamules and the podetia are capitate, white, mealy, sorediate.

S. Meyeri was described from Mt. Kilmandscharo, H. Meyer 1887. An authentic specimen in Herb. Boissier was referred to *S. ramulosum* var. *farinosum* by Müll. Arg., Bot. Jahrb. [Engler] **15**: 512. 1893 and this reference concurred in by RIDDLE.

S. ramulosum var. *Bornmuelleri* (Steiner) Müll. Arg. Bot. Jahrb. [Engler] **15**: 512. 1893. — *S. Meyeri* var. *Bornmuelleri* Steiner, Jahresber. Schles. Ges. vaterl. Cultur **66**: 134. 1888 also from Mt. Kilimandscharo, H. MEYER, 1887 is referred here by RIDDLE although kept distinct by MÜLLER ARGAU and ZAHLBRUCKNER, after study of

authentic specimen in Herb. Boissier. This differs only in having the squamules reduced and papillaeform in the upper half of the podetia.

var. **strigosum** Th. Fr., De Stereoc. et Piloph. Comment. 12. 1857.

Type from New Zealand, RICHARD, (Voy. Astrolabe pl. 9. f. 3) not found at Upsala.

var. **microcarpoides** Müll. Arg., Flora 72 : 505. 1889.

Type « ex itinere australasico » [New Zealand, Fiji Islands, or Queensland] WALKER in Herb. Boissier, resembles a miniature *S. macrocarpum* with apothecia and cephalodia small. Of doubtful value.

Stereocaulon macrocarpum Richard, Voy. Astrolabe 1 : 34. *pl.* 9. *f.* 4. 1832.

Type from New Zealand, RICHARD, A portion of Richard's herbarium passed to Le Comte de Franqueville from whom it was purchased by Hue and is now in the Museum d'Hist. Nat. Paris. Among these, a specimen labeled « *Stereocaulon ramulosum* no. 4 — échantillon figuré, Nouvelle Zélande, Herbarium Richard », may be considered the type. It is small and fragmentary, almost devoid of squamules.

Podetia solitary or caespitose, 6-10 (-20) cm. high, at base 2-4 mm. broad, above 1-2 mm. broad, irregularly and repeatedly branched from near the base, branches long and ascendant, with shorter spreading branches above, mostly decorticate and polished glabrous, but often with patches of rugose and rimose cortex, especially near the tip. Squamules mostly entirely absent on the upper half of the podetia or sometimes a few scattered and much reduced. Below, squamules crowded and well developed, reaching 5 (-10) mm. in length, coralline, repeatedly branched, irregular, terete and rugose, in caespitose specimens the squamules often forming a dense mass. Apothecia terminal, 1.5-3 (-5) mm., varying much in color from tawny to almost black, convex and emarginate from the beginning and finally hemispherical to subglobose and sometimes flexuous. Hypothecium hyaline, spores 35-45-56 × 3.5-4.5 μ, 4-6 locular, blunt at both ends. Cephalodia of the type of *S. ramulosum* but typically very deeply scrobiculate, flexuous and larger, reaching 7 mm. diameter, always tawny, containing *Chroococcus*.

The species is closely related to *S. ramulosum* with which transi-

tional forms certainly occur. Best distinguished by the absence of squamules above and by the large, deeply scrobiculate (foveolate) cephalodia.

Stereocaulon Richardianum Mont. apud Th. Fr. Nova Acta Reg. Soc. Sci. Upsala III 2 : 348. 1858 as subsp. of *S. vulcani* (Bory) Th. Fr. which is *S. scutelligerum* Th. Fr. 1867 not *S. vulcani* (Bory) Ach. 1810.

Type from Mauritius, Ile Bourbon com. RICHARD in Herb. Montagne Mus. Paris. It appears to be a very curious and abnormal form of *S. scutelligerum* with the podetia almost entirely denuded of squamules and smooth, polished with few branches so that each podetium is whip-like. Such squamules as are present as well as the apothecia, and the attenuate, recurved tip of the podetia all agree with *S. scutelligerum*.

Stereocaulon rivulorum H. Magnusson, Göteborgs K. Vetensk. och Vitterh. Samh. Handl. IV. **30** : 7 : 63. 1926.

Stereocaulon roccelloides Th. Fries, De Stereoc. et Piloph. Comment. 13. 1857.

Type from mountains of Hawaiian Islands, ANDERSSON in Herb. Upsala. Spores 22-36 × 2.5-3.5 μ. This specimen seems to be a mixture of *S. rubiginosum* Pers. and *S. microcarpum* Müll. Arg. Zahlbruckner treats it as a synonym of ther former, also from the Hawaiian Islands.

Stereocaulon rubiginosum Pers. apud Gaudichaud, Voy. Uranie Bot. 212. 1826. [12 Sept. 1827.]

Stereocaulon sanguineum Delise in litt.

Type from Hawaiian Islands (3-400 hex.) Voy. Uranie. « Parvum, ramosissimum rubiginosum, ramis attenuatis, scutellis convexis nigris. Il se distingue de ses congénères par une légère couleur rouge-brun ; mais du reste il diffère peu du *Stereocaulon botryoïdes*. Il s'est coloré en rouge foncé par sa macération dans l'eau de mer et a fourni une grande quantité de teinture. Il croît sur la lave en décomposition. »

Stereocaulon salazinum (Bory) Fée, Essai Crypt. Ecorc. Officin. xcvii. *pl.* 3. *f.* 7. 1824.

Lichen salazinus Bory, Voy. Quatre Iles d'Afrique **1** : 393. 1804 ; 3 : 106. pl. 16. f. 3. 1804.

S. assimile Nyl., Syn, Meth. Lich. 249. 1860 fide Th. M. Fries, Flora **44** : 412. 1861.

Type : original sheet in Herb. Bory at Mus. Paris states « Les rochers de la plaine des chicots. Plus beau aux Salazer. Ile de la Réunion aux de la République. » This sheet contains 15 specimens, all forms of *S. ramulosum* (sensu latiore) and BORY's original figure indicates the same thing.

Type of *S. assimile* Nyl. from Ins. Borbonia, BORY DE ST. VINCENT in Mus. Pairs is more slender than typical *S. macrocarpum*.

This doubtful species has been the cause of much confusion because BORY DE ST. VINCENT identified 3 specimens from Ile Mascareigne, LEPERVANCHE 1837 as his *S. salazinum*. This latter sheet was taken by NYLANDER as type of his *S. salazinum* which is *S. scutelligerum*. A specimen in Herb. Müller Argau at Herb. Boissier agrees with it, having algae sparingly present in the apothecium, hypothecium fuscous, spores 6-locular, 45 × 3.5 μ. Perhaps this led ZAHLBRUCKNER in his *Catalogus* to place this species in Section *Lecanocaulon*.

Stereocaulon saxatile H. Magnusson, Göteborgs K. Vetensk. och. Vitterh. Samh. Handl. IV. **30** : 7 : 41. 1926.

Stereocaulon saxonicum Bachmann, Hedwigia **67** : 109. 1927.

Stereocladium tyroliense Bachmann, Hedwigia **66** : 157-162. 1926. **67** : 99-107. 1927 not ARNOLD as var. nor NYLANDER.

Stereocaulon scutelligerum Th. Fr., Flora **44** : 412. 1861.

Stereocaulon vulcani Th. Fr., De Stereoc. et Pilophor. Comment. 25. 1857. not (Bory) Ach.

S. salazinum Nyl. Ann. Sci. Nat. Bot. IV. **11** : 250. 1859. Not (Bory) Fée.

The following description is based on material from Ile Mascareigne, LEPERVANCHE, 1837 and misdetermined *S. salazinum*, also material from Ile Bourbon ex herb. BORY com. G. THURET, to whom a portion of Bory's herbarium was sold. This material was responsible for Nylander's misconception of *S. salazinum* (Bory) Fée.

Podetia loosely caespitose, forming masses which readily separate into the component podetia which are 6-8 cm. tall, 1-1.5 cm. in dia-

meter, attenuate above and curved, subsimple below, sparingly branched above, branches 2-20 mm. long, the shorter branches spreading or even recurved, the longer ascendant ; the podetia wholly decorticate, arachnoid above. Squamules partly reduced to granules or papillae, partly better developed and then about 1 mm. long, occasionally reaching 2.5 mm., coralline, terete, simple or irreguarly branched, attenuate, surface uneven. Apothecia wholly lateral, distinctly pedicellate with the stalks so well developed as to make the apothecia appear terminal on short side branches. Apothecia small (0.4-0.8 mm.) when young, plane with a pseudothalline margin, then becoming convex and emarginate, fuscous to almost black. Cephalodia doubtful. Appearance close to that of *S. sphaerophoroides* Tuck.

In an authentic specimen in Herb. Boissier, algae are sparingly present in the apothecium, hypothecium fuscous, spores 6-locular ; 45 × 3.5 μ.

Stereocaulon sinense Hue, Nouv. Arch. Museum [Paris] III. **10** : 251. 1898 ; Ibid. IV. **1** : *pl.* 3. *f.* 4. 1899.

Type from Yun-nan, China, DELAVAY, 7/31/88 in Mus. Paris.

Podetia solitary, 25-45 mm. tall, about 1 mm. in diameter, simple below, with a few short, spreading branches above, decorticate and arachnoid, or partly rugose-corticate, without squamules on one side. Squamules below, coralline, terete, acute, smooth, simple or sparingly branched, — above, papillaeform, short, 0.5-1 mm. stiffer, closely set and strigose. Apothecia terminal, 1.5-2 mm. developing in truncate tubercles, then expanded and hemispheric with a thin margin. Hypothecium hyaline. Spores multilocular, spirally contorted, 130-150 × 3-4 μ. Cephalodia small, under 1 mm., olivaceous, less scrobiculate than usual, but otherwise of the *S. ramulosum* type containing *Scytonema*.

This species is transitional between *S. nesaeum* and *S. macrocephalum*, agreeing with the former in the lower squamules and general habit, with the latter in the strigose upper squamules and terminal apothecia. However, the squamules and the apothecia are much smaller than in *S. macrocephalum* and the podetia more slender and less rigid.

Stereocaulon sorediiferum Hue, Nouv. Arch. Mus. [Paris] III. 10: 250. 1898.

Type from Japan, circa Yokosha,, SAVATIER, Mus. Paris.

Podetia solitary, 2-5 cm. tall, 0.6-1.0 mm. in diameter, slender and curving with long, ascending branches from the lower part and short spreading branchlets above, surface more or less corticate, but the cortex rimose and absent in some parts, glabrous ; squamules coralline, terete, frequent, especially below where they are crowded, elongated and repeatedly branched, those along the sides of the podetia simpler, shorter, and mostly white, capitate-sorediate. Cephalodia olivaceous or partly tawny, small, mostly 0.5 mm. but occasionally up to 1 mm., subpedicellate and more or less scrobiculate (type of *S. ramulosum*) containing *Scytonema*. Apothecia on the ends of the side branchlets, developing as in *S. Claviceps ;* when mature, hemispheric to almost globular and 0.6-1 mm. in diameter, badius. « Hypothecium pale, spores more or less spiral, 100-110 × 4 μ. »

Stereocaulon spathuliferum Vainio, Ark. f. Bot. 8 : 4 : 36. 1909.

Type from Nesheimshorgen in Granvin, Hardanger, Norway J. HAVAAS. H. MAGNUSSON, after studying a collection from Nesheimshorgen in Granvin, Hardanger Norway J. HAVAAS, concludes that this is only an unimportant form of *S. fastigiatum* var. *dissolutum*. RIDDLE did not see the type.

Stereocaulon sphaerophoroides Tuckermann, Enum. N. Am. Lich. 52. 1845.

S. tomentosum var. *azoreum* Schaerer, Enum. Crit. Lich. Eur. 182. 1850. *S. azoreum* Nylander, Acta Soc. Linn. Bordeaux 21 : 1857. [Prodr. Lichenog. Gall. Alger. 41. 1857.]

S. leporinum Th. Fr. De Stereoc. et Pilophor. Comment. 25. 1857.

S. granulosum Laurer in Hartung, Neue Denkschr. Allgem. Schweizer Geselsch. 15 : 147. 1857. — *S. tomentosum* var. *granulosum* Olivier, Mem. Acad. Cienc. y Art. Barcelona III. 16 : 476. 1921.

S. maderense Tuckerman, Bot. Wilkes Exped. 122. 1861.

Type : Azores, HEWETT C. WATSON 1842 in Tuckerman Herb. at Farlow Herb.

Type of *S. tomentosum* var. *azoreum* from Azores, GUTHNIK, not seen.

Type of *S. leporinum* uncertain. Four specimens are cited, of which two are definitely attributed to the two varieties, leaving specimens from near Rio Frio, Madeira, DIEDRICHSEN and Funchal com. BLYTT. Neither commented upon by RIDDLE.

Type of *S. granulosum* not seen, distributed by HEPP, Flecht. Europas 305.

Type of *S. maderense* from Madeira, Pico Ruivo, PICKERING, Wilkes Expedition in Tuckerman Herb. at Farlow Herb.

var. **elatum** Th. Fr. Nova Acta R. Soc. Sci. Upsal. III. 2: 349. 1858.

S. leporinum f. *elatum* Th. Fr. De Stereoc. et Piloph. Comment. 25. 1857.

Type from Selva de las Mercedes, Teneriffe, BOURGEAU, Pl. Can. it. sec. 1594.

var. **pumilum** Th. Fr., Nova Acta Reg. Soc. Sci. Upasl. III. 2: 349. 1858.

S. leporinum var. *pumilum* Th. Fr. De Stereoc. et Piloph. Comment. 25. 1857.

S. botryosum Mont. in Webb, Hist. Nat. Iles Canar. 32: 117. 1840 non Ach.

Type from la cumbre de Lasos, Canary Islands WEBB. not found at Upsala.

Stereocaulon spissum Nyl. apud Hue, Rev. Bot. 6: 192, b. 1887-1888.

RIDDLE, after studying Zwack 997 from Oldenburg, states that this is a depauperate form of *S. coralloides*.

Stereocaulon strictum Th. Fr., De Stereoc. et Piloph. Comment. 24. 1857.

S. peladense Vainio, Dansk. Bot. Ark. 4: 11: 7. 1926.

Type of both based on collection by LIEBMANN from the Mts. of Mexico. VAINIO renamed this species on account of *S. strictum* (Bab.) Nyl. which was described three years later.

At one time RIDDLE contemplated uniting *S. nesaeum* with this species. « The description of *S. nesaeum*... applies to *S. strictum,* except apothecia mostly lateral, a few terminating branchlets. The podetia are tomentose but scarcely densely so. The squamules are somewhat more evenly distributed. A specimen from Rio Janeiro, GLAZIOU 1868, det. Krempelhuber as *S. nesaeum,* offers a good transition as to the apothecia which are mainly terminal but some lateral. »

Stereocaulon subcoralloides Nyl. apud Norrlin, Notiser Sällsk. Fauna et Fl. Fen. Forhandl. **13** : 432. 1874 ; apud Vainio, Meddel. Soc. Fauna et Fl. Fenn. 2 : 43. 1878.

S. paschale f. *subcoralloides* Nyl., Lich. Scand. 64. 1861.

S. coralloides var. *conglomeratum* Fr., Lich. Eur. 202. 1831. (fide Zahlbr. and Magnusson.)

Type in Mus. Fenn. is merely a small form of *S. coralloides*- Riddle.

Type of *S. coralloides* var. *conglomeratum* Fr. from Norway, AHNFELT, also specimen ex Herb. Wahlenberg cited by Th. Fr., De Stereoc. et Piloph. Comment. 17. 1857 in Herb. Th. Fr. Upsala.

A dwarf form with more or less denuded podetia and slender, short, squamules, which may be so reduced as to appear granuliform. Undoubtedly some puzzling specimens attributed to *S. paschale* and some of the American specimens referred to *S. denudatum* belong here. The apothecia are terminal and dilated (as in Frost's Vermont material of *S. denudatum*) and the habit is erect, shrubby about 1.5-2 cm. tall. It appears to be frequent in Scandinavia. *S. paschale* v. *conglomeratum* Fr. is different, having distinctly palmate digitate squamules.

f. **pumilum** (Nyl.) Zahlbr. Catalogus Lich. Univ. 4 : 668. 1927.

S. coralloides var. *conglomeratum* Nyl. apud Harm. Lich. France 3 : 361. 1907.

Stereocaulon subintricans Nyl. Flora 58 : 358. 1875.

? S. tortuosum Del. apud Hulting, Bihang till K. Svensk. Vet. Akad. Handl. **26** : Afd 3 : no. 3 : 17. 1900 ; H. Magnusson, K. Vet. o. Vitterh. Samh Handl. **30** : 7 : 83. 1926.

Type from Hollola, Finland, LANG in Mus. Fenn. is reduced form of *S. paschale* fide Riddle.

From the description of *S. tortuosum* Del. apud Hulting given by MAGNUSSON, it seems likely that this is distinct from *S. subintricans* Nyl.

Stereocaulon submollescens Nyl. Comptes rendus Acad. Sci. Paris 83 : 88. 1876.

Type : Expédition astronomique à l'ile Campbell 1874. M. FILHOL. in Mus. Paris, co-type in Herb. Kew. Podetia 4-6 cm. tall, about 1 mm. broad, irregularly branched, squamules scattered, more or less branched. Cephalodia as in *S. ramulosum,* apothecia absent.

Probably not specifically distinct from *S. exalbidum.*

Stereocaulon tomentosum Fr., Sched. Crit. ad Lich. Suec. Exs. 3 : 20. 1817.

Patellaria tomentosa var. *decumbens* Wallr., Fl. Cryptog. Germ. 3 : 440. 1831.

Stereocaulon tomentosum var. *campestre* Koerber, Syst. Lich. Germ. 11. 1855.

S. tomentosum var. *incisocrenatum* Schaerer, Enum. Crit. Lich. Eur. 181. 1850.

Specimens distributed in FRIES Lich. Suec. no. 90. in copy at Upsala, which is also the type of the above varieties. Podetia erect. about 5 cm. tall, 1-2 mm. in diameter, densely covered with coarse tomentum. Squamules, cephalodia and apothecia as generally understood for this species.

RIDDLE also notes material from North America, India, Hungary, Russia, Sweden, Germany, Scotland, England, Norway, Northern Italy, Manchuria, Thibet.

f. **flabelliforme** Ohlert, Schrift. K. Phys. Oekonom. Ges. Koenigsberg **11** : 8. 1870.

This from from Oletzko, Angerburg and Neustadt in Prussia seems not to have been noticed since it was first described. It was characterized by a flabelliform habit, squamules crowded above to form a continuous crust, nearly naked below. *S. spathuliferum* and the various varieties of *S. fastigiatum* should be compared with this form.

f. **tectorum** Tomin, Mem. Inst. Agronom. Voronezh, **3** : 127. pl. 2. f. 1-3. 1918 (quoted from Zahlbruckner, not seen).

var. **simplex** Riddle, Bot. Gaz. **50** : 298. 1910.

Type from Washington, Mt. Ranier, T. C. FRYE in Herb. Riddle at Farlow Herb., cotypes in Fink Herb. and Wellesley Coll. Herb.

var. **magellanicum** Th. Fr. De Stereoc. et Piloph. 31. 1857.

Type from Straits of Magellan ANDERSSON, also LECHLER 997 both in Herb. Upsala. Podetia (2-)-3 cm. tall, erect to somewhat spreading, about 1 mm. in diameter tomentose above, becoming subglabrous below ; branching as in *S. tomentosum* but more compact.

var. **walamoense** Nyl., Syn. Meth. Lich. **1** : 244. 1860.

MAGNUSSON after study of type from Lake Ladoga, Walamo Island, in Mus. Paris, was unable to decide, but suggested a transfer to *S. alpinum*.

Stereocaulon turfosum Bory de St. Vincent apud Dumont D'Urville, Mem. Soc. Linn. Paris **4** : 596. 1826.

Type from Falkland Islands, DUMONT D'URVILLE.

« Thallo ramoso-pulvinato, rigidissime coarctato, ramis compressis tortuso-intricatis. »

Stereocaulon tyrolíense (Nyl.) Zahlbr. apud Bachmann, Hedwigia **66** : 157. 1926.

Stereocaulon tyrolíense Nyl. Flora 58 : 302. 1875 ; Bachmann, Hedwigia 67 : 107-108. 1927.

Stereocaulon alpinum var. *tyrolíense* Arnold, Verh. zool.-bot. Ges. Wien **27** : 549, 566. 1877.

S. tomentosum var. *tyrolíense* Olivier, Mem. Soc. Sci. Nat. Cherbourg **36** : 162. 1907.

Type in Brenner Tyrol, ARNOLD, issued in Arnold Lich. Exs. 1541. This entity has been variously referred by authors to *S. alpinum* or *S. pileatum*, e. g. Riddle states « an unusually granulate sorediate state of *S. pileatum* but no apothecia hence not certain » after a study of the type in the Mus. Fenn. E. Bachmann, Hedwigia 67 : 99-109. 1927, after a thorough study of all the material in Arnold's Herbarium

in München, concludes that it is a distinct species confined to the Tyrol (see *S. saxonicum*).

var. **lapponicum** H. Magnusson, Göteborgs K. Vet. o. Vitterh. Samh. Handl. **30** : 7 : 74. 1926.

Type from Lycksele lappmark : par. Tärna, Björkfors, 3 specimens near by Syterbäcken and Kvarnbäcken, 1924.

Stereocaulon uvuliferum Müll. Arg., Flora **74** : 109. 1891.

Type : Mt. Tomba, Japan, MIYOSHI in Herb. Boissier at Geneva.

Podetia solitary or loosely caespitose, 20-30 mm. tall, 1-1.5 mm. in diameter, subsimple below with a few spreading branches above, wholly decorticate and glabrous or nearly so, mostly denuded at the base and occasionally on one side. Squamules densely crowded, mostly under 1 mm. in length, slender, terete, simple or rarely once branched, uneven, partly reduced and papillaeform, obtuse ; apothecia terminal, frequent, 1-2 mm., emarginate, convex and more or less flexuous, black or nearly so ; cephalodia sessile or nearly so, in irregularly rounded masses, which are 0.4-0.8 mm .in diameter and indistinctly botryose, with the parts concrescent, clearly approaching the cephalodia of the *S. paschale* group, but containing *Gloeocapsa*. Spores 4-locular, 22-36 × 3.5 μ, obtuse at both ends, hypothecium pale.

Stereocaulon verruculigerum Hue, Bull. Soc. Bot. France **54** : 417. 1907.

Type : Herb. Boissier, Java, Roland BONAPARTE Jan. 1903.

Podetia caespitose, 15-20 mm. high, about 1 mm. broad, divaricately branched, decorticate, faintly arachnoid ; squamules mostly reduced to minute papillae, very numerous and dense, occasionally longer, terete, simple or once branched ; apothecia terminal, 1.5-2.0 mm. convex, emarginate, blackish ; cephalodia of the type of *S. paschale*.

Stereocaulon vimineum Th. Fr., De Stereoc. et Piloph. Comment 13 : 1857.

Type from Tiwzutlan, 7000 ft. Mexico June 1841, LIEBMANN.

Very close to *S. sorediiferum* Hue having the same flexuous podetia, identical squamules, partly white capitate, and similar apo-

thecia, some of which are distinctly margined. But some of the specimens are more branched, and the lower squamules are very beautifully developed reaching 8 mm. in length and repeatedly branched. There are no typical apothecial tubercles, but the youngest apothecia are so thick margined as to be subtuberculate. The very flexuous podetia are especially characteristic. Podetia 3-6 cm. tall, 1-1.5 mm. in diameter.

Stereocaulon virgatum Ach. in Sprengel, Syst. Veg. 4 : 1 : 275. 1827.

S. furcatum Auct. non Fr.

f. *achariana* Vainio, Jour. Bot. Brit. For. Suppl. 4. 1895.

Type from Guadeloupe in Mus. Fenn. in excellent condition. One specimen fastigiate above with five branches. A black Stigonemalike growth scattered along the podetia, no true cephalodia. VAINIO states whole plant becomes yellow with KOH.

f. **primaria** Vainio, Jour. Bot. Brit. For. Suppl. 4. 1895.

Type from Laudat, Dominica W. R. ELLIOTT 889 and Souffrière 1000-3000 ft., St. Vincent, W. R. ELLIOTT 143.

f. **applanata** Vainio, Jour. Bot. Brit. For. Suppl. 4. 1895.

Type from Richmond Valley, St. Vincent, W. R. ELLIOTT 193.

Stereocaulon Wrightii Tuckerman, Am. Jour. Sci. 28 : 202. 1859.

Stereocladium Wrightii Nyl. apud Hue, Nouv. Mem. Mus. [Paris] III. 2 : 245. 1890. *Phyllocaulon Wrightii* Vainio, Ark. f. Bot. 8 : 4 : 36. 1909.

Stereocaulon apocalypticum Nyl. apud Middendorf, Reise in den äussersten Norden und Ost-Sibirien 4 Anhang 6 : lv. 1867. *Stereocladium apocalypticum* Nyl., Bull. Soc. Linn. Normand. IV. 1 : 268. 1887.

Type from Arakamtchetchene Is., Behring Sea, C. Wright in Tuck. Herb. at Farlow Herb.

Type of *S. apocalypticum* from Monte Ket Kat, Stanovoi Chrebet, Sibir. Orient, MIDDENDORF, 1844. in Mus. Fenn.

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